

MINNESOTA MEDICINE

Journal of the Minnesota State Medical Association

EDITOR

CARL B. DRAKE, M. D., St. Paul

ASSISTANT EDITORS

STANLEY R. MAXEINER, M. D., Minneapolis

PAUL D. BERRISFORD, M. D., St. Paul

ASSOCIATE EDITORS

First District

GEO. S. WATTAM, M. D., Warren

Third District

E. L. TUOHY, M. D., Duluth

Fifth District

GEO. B. WEISER, M. D. New Ulm

Second District

A. W. IDE, M. D., Brainerd

Fourth District

F. L. ADAIR, M. D., Minneapolis

Sixth District

A. E. SPALDING, M. D., Luverne

Seventh District

H. B. AITKENS, M. D., LeSueur Center

Eighth District

A. F. SCHMITT, M. D., Mankato

OCTOBER, 1920

CONTENTS

ORIGINAL ARTICLES

- M. S. HENDERSON, M. D.—Tuberculosis of the Knee Joint in Children..... 463
- E. L. TUOHY, M. D.—A Study of Chest Conditions Associated with Aortic Diseases, Specific and Non-Specific 471
- ROOD TAYLOR, M. D.—Chronic Interstitial Nephritis in Children..... 481
- O. W. HOLCOMB, M. D.—Acute Dilatation of the Stomach 486
- A. L. McDONALD, M. D.—Pre-Eclamptic Toxemia and Post Partum Eclampsia.... 494
- CHARLES N. HENSEL, M. D.—The Mechanics of Digestion 497

(Continued on Advertising Page III.)

Owned and Published Monthly by

THE MINNESOTA STATE MEDICAL ASSOCIATION

BUSINESS MANAGER

J. R. BRUCE, 403 Central Bank Bldg., Saint Paul

Telephone: N.W. Cedar 1683

Entered at the Post Office in Saint Paul as second class mail matter.

Accepted for mailing at the special rate of postage provided for in section 1103, act of October 3, 1917, authorized July 13, 1918.

Subscription Price { \$3.00 yearly, Domestic
\$3.50 yearly, Foreign

NOTICE

IN view of the fact that the raw material used in manufacturing of PYOKTANIN CATGUT has advanced so considerably in price, we find it absolutely necessary to make an advance in the price of the finished product. We have refrained from doing this as long as possible. The Ramsey County Medical Society has exclusive control of the manufacture of this Catgut—no outside capital being invested. Any profits made are all for the benefit of the medical profession. We trust you will realize the necessity of our doing this and will continue to give us your valued patronage.

PRICE LIST OF PLAIN AND FORMALIZED PYOKTANIN CATGUT

Manufactured by
The Laboratory of the Ramsey County Medical Society
LOWRY BUILDING
ST. PAUL, MINN.

	Per Dozen Strands
Size OO—14 inches.....	\$0.85
Size O—14 inches.....	1.00
Size 1—14 inches.....	1.20
Size 2—14 inches.....	1.35
Size 3—14 inches.....	1.50
Size 4—14 inches.....	1.60
<hr/>	
Size OO—28 inches.....	\$1.20
Size O—28 inches.....	1.40
Size 1—28 inches.....	1.60
Size 2—28 inches.....	1.80
Size 3—28 inches.....	2.00
Size 4—28 inches.....	2.20

Special Discount to Hospitals and to the Trade.

Cash must accompany the Order

ADDRESS:

Laboratory Ramsey County Medical Society
Lowry Building, Saint Paul, Minnesota

For Sale by all Druggists

MINNESOTA MEDICINE

Journal of the Minnesota State Medical Association

VOL. III

OCTOBER, 1920

No. 10

ORIGINAL ARTICLES

TUBERCULOSIS OF THE KNEE JOINT IN CHILDREN*

M. S. HENDERSON, M. D.
Section on Orthopaedic Surgery,
Mayo Clinic, Rochester, Minn.

Tuberculosis of the joints in the order of frequency affects first the vertebral column, second the hip, and third the knee. The knee joint being superficially placed presents more objective signs than the hip or the spinal column. Tuberculosis of the knee is commonly supposed to be about evenly divided in the sexes, and a little more common on the right side than on the left. It is more often encountered in childhood and in early adult life, but is to be seen at all ages. Since the disease is further away from the trunk it is less dangerous to life than tuberculosis of the hip or of the spine. The treatment of this joint is easier than of the hip for the two long levers making up the joint permit of comparatively easy fixation, whereas in the hip joint the fixation apparatus must at least include the entire pelvis in order to provide rest for the affected joint.

ETIOLOGY AND PATHOLOGY

The disease is caused by the tuberculosis bacillus, either human or bovine. It is hematogenous in origin, always being secondary to a tuberculous focus elsewhere in the body. The usual primary focus is the lymph glands, particularly the upper deep cervical, bronchial, or mesenteric group. As a result of the caseation of these glands and a breaking down of one of the vessels, the debris with some of the tuberculosis bacilli enter the blood stream and are carried as small emboli to the right side of the heart and thence through the lungs into the

systemic circulation. It is possible also that the bacilli may gain entrance to the thoracic duct and be carried through it into the general circulation.

The reason that the bacilli select the bones and joints for a habitat may be explained on anatomic grounds. The blood supply to the long bones may be divided into three systems: (1) diaphyseal, (2) metaphyseal, and (3) epiphyseal (Fig. 1). The diaphyseal system is the least concerned with the subject under discussion, but the vessels of this group run toward the epiphyseal end of the bone and anastomose with the metaphyseal vessels, the latter gaining entrance from the periosteal structures. All three systems anastomose quite freely at the metaphyseal area and, the vessels being larger, the circulation is correspondingly slower than elsewhere; therefore, any emboli of bacilli are apt to be arrested here. Fraser of Edinburgh did a large amount of experimental work on surgical conditions of bones and joints and found that it was difficult to infect bone marrow with tuberculosis, even when he injected the bacilli directly into the marrow cavity; since he knew that clinically bone tuberculosis is common he concluded that some change must first take place in the marrow in order to make the field suitable for the growth of the tuberculosis bacilli. He decided that a gelatinous degeneration in the marrow substance must first occur, and that such degeneration must be caused by the tuberculous toxemia or a hemorrhage in the bone substance. On such a medium the tuberculosis bacilli flourish. Sir Harold Stiles, for many years chief surgeon to the Royal Edinburgh Hospital for Sick Children, reminds us that comparatively mild trauma may loosen an epiphysis and he therefore believes that some of the so-called sprains may easily cause a hemorrhage in the metaphyseal area and thus provide, in the hemorrhage, a suitable field for

*Presented before the Southern Minnesota Medical Association, Fairmont, Minn., June, 1920.

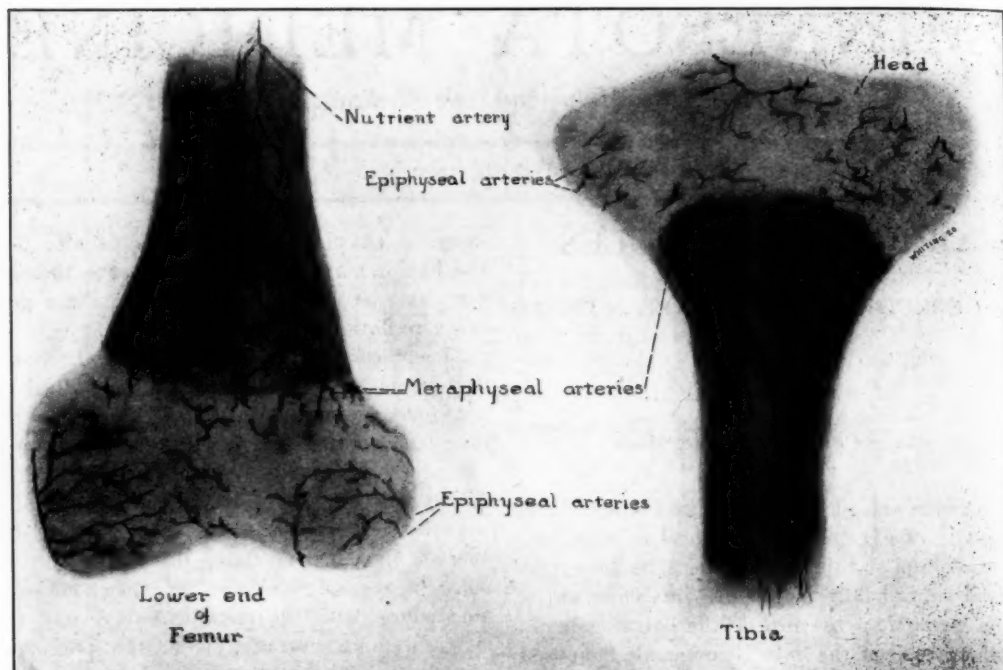


Fig. 1. Blood supply to bone ends (Lexner).

tuberculosis bacilli to be deposited by the blood stream to begin their deadly work. This may happen many more times than would seem possible and the resistance of the victim be so great that he is able to cope with the infection. It is possible that an embolus of tuberculosis bacilli may be locked up in this way during childhood, leaving an area that is a good site for the development of tuberculosis in adult life.

Just how the tuberculosis bacillus gains entrance into the human body is of great interest. It is often thought that the dried excretion and sputum in the form of dust is inhaled, thus introducing the bacillus. Lawrason Brown has recently reported some experiments in which he collected dust and dirt from hovels previously occupied by persons who had died of pulmonary tuberculosis. This material was emulsified and injected into guinea pigs intraperitoneally with negative results. It was only by practically taking the material from the lips of patients with open pulmonary tuberculosis that he was able to produce positive results in guinea pigs. Such experiments seem to indicate

that we have over-estimated the danger of infection by dried bacilli, but this should in no way permit of fewer precautions. From clinical experience, we well know the danger from contact and intimate associations.

In 1901, when Koch read his paper at the International Medical Congress in London, he made some statements that show how far from the truth even so great a man as he can stray when he states as facts what are in reality merely impressions. He stated that, "the bacillus of human tuberculosis is incapable of producing tuberculosis in the bovines" and "the bacillus of bovine tuberculosis is to be considered as practically incapable of transmission to man and that consequently the danger of contracting phthisis from the milk or meat of tuberculous bovines need no longer be guarded against". This brought forth much criticism and the question remained open until the work of Stiles and Fraser proved the error of Koch's statement. These observers had under their care many cases of surgical tuberculosis in children in the Royal Edinburgh Hospital for Sick Children and when a patient with tubercu-

losis was brought to the hospital, the home of the patient was visited to investigate the living conditions, and to determine whether any members of the household or family were or had been suffering from tuberculosis in any form. The food was looked into and it was not long before the investigators were convinced that the milk supply, at any rate in the vicinity of Edinburgh, was a great medium for conveying bovine tuberculosis bacilli. Miller and Mitchell concluded that from 16 per cent to 20 per cent of the Edinburgh milk was infected with tuberculosis bacilli.

Fraser very carefully examined the material obtained from the cases of surgical tuberculosis and determined whether it was due to the human or bovine type. He proved by various laboratory tests that 62 per cent of a series of cases of proved bone and joint tuberculosis owed their origin to the bovine type of bacillus. Seventy-one per cent of the 38 per cent said to be due to the human type presented a history of tuberculosis, usually pulmonary, existing or having existed in some member of the family with whom the patient had been intimately associated. Fraser found while carrying on these experiments that it was easy to produce synovial tuberculosis in animals by introducing bacilli into the blood stream. Stiles believes that the infection is apt to be in the synovia more commonly in the knee than in any of the other joints. Trauma, as shown by this experimental work, at least as far as the bones are concerned, plays a prominent part in the production of tuberculosis; these observers agreed that a comparatively slight injury to the metaphyseal area may cause a slight hemorrhage and thus provide the field for growth to the bacillus.

DaCosta says, "To deny the possibility of traumatic tuberculosis is to deny many of the truths of pathology and some of the plainest lessons of clinical medicine." As far back as 1880, Max Schuller injected tuberculosis bacilli into the trachea of dogs and at the same time injured the right knee. Some of the animals developed a general tuberculosis and some a condition that appeared histologically to be a tuberculosis of the right knee. The knee that was not subjected to trauma was not affected in any case. Koenig maintained that trauma was



Fig. 2. Girl aged 5. Six months' history. Disease apparently primary in patella.

the causal influence in one half the cases of tuberculous joints.

As shown by the anatomic work of Lexer, the synovial vessels, the metaphyseal vessels, and the diaphyseal vessels freely anastomose. Stiles states that there is no reason why both synovial and metaphyseal tuberculosis should not exist at the same time and that consequently there is no reason why one should not be secondary to the other.

While from the viewpoint of treatment there is a great difference between tuberculosis of the knee joint in the adult and the like condition in the child, the same is not true of the pathology. Although the pathologic picture is apparently different, the difference is readily explained by the fact that there is a preponderance of cartilage in the knee joint of the child. It is generally conceded that tuberculosis rarely, if ever, develops in cartilage. How then can we explain the common occurrence of the disease in childhood? In the first place, milk is a more common article of diet for the child than for the adult; second, trauma of the joint and possibly injury to the epiphyseal (metaphyseal) line is more common; third, children are more susceptible to all forms of infections, the immunity they possess being hereditary and not acquired, and fourth, the infection may often be primary in the synovia, gaining entrance through synovial vessels. It is not ex-

tremely rare to meet with the disease primarily in the patella (Fig. 2).

SYMPTOMS

The train of symptoms is more or less definite and if there is any symptom of more importance than others it is the persistency of the complaint (Fig. 3). There are remissions but no intervals of complete freedom. Often a history of trauma is elicited definitely preceding the onset of symptoms. A limp worse in the morning due to stiffness may be noted by the parents even before the child complains. Pain, although generally mild, may be severe; in the latter case the onset is acute, simulating an acute infection. The suffering in such instances is extreme. Pain is a much less prominent symptom than in tuberculosis of the hip joint. Also, since the knee joint is a simple hinge joint, the mechanism back of the deformity produced is much simpler than that in the hip joint. The joint is superficially placed and the changes in the capsule of the joint are not hidden by muscular structures. The swelling produced by

the effusion within the cavity and the inflammatory thickening of the capsule are at once evident. Local heat can be detected on palpation but redness is only present when secondary infection supervenes, hence, the name "white swelling".

Flexion is the primary deformity but as the disease progresses, the secondary deformities of external rotation with consequent knock-knee and subluxation develop (Fig. 4). Flexion advances rapidly due to the fact that once it is present the hamstrings have a great advantage over the extensors. The biceps femoris through its insertion into the head of the fibula tends to flex and rotate outward and abduct the tibia, producing knock-knee. As the flexors gain the advantage, they tend to pull directly back on the tibia as it is flexed and produce a subluxation, a most troublesome deformity with which to deal. Atrophy of the thigh and calf muscles ensues and it appears to be more than the mere atrophy of disuse. Associated with this is atrophy of the bone, which shows

Tuberculosis of the knee in Childhood

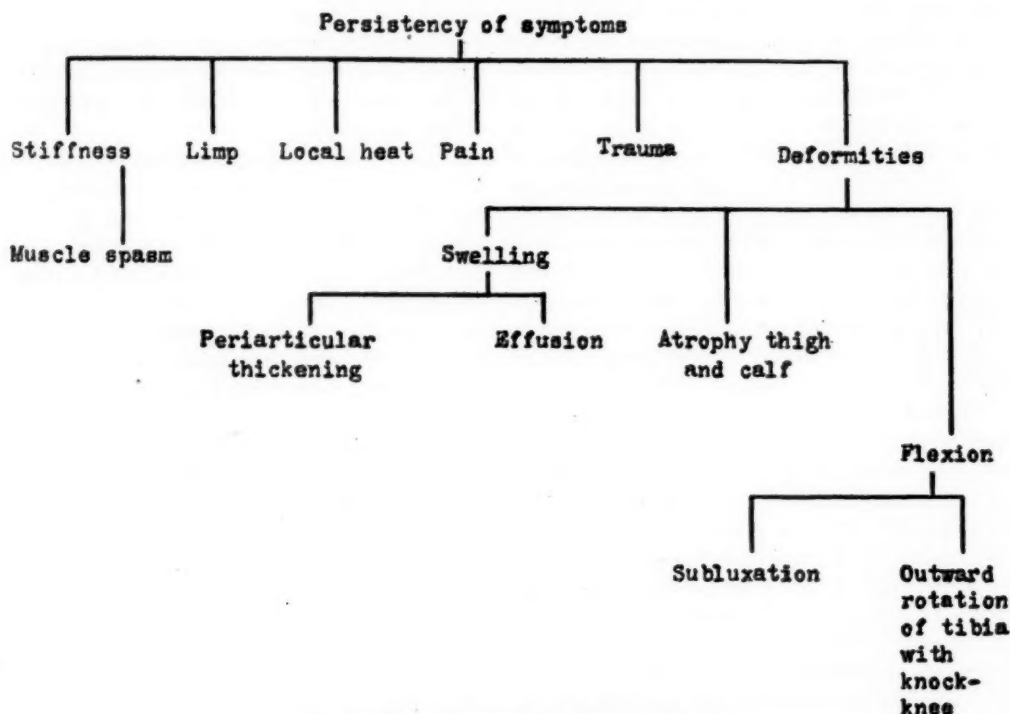


Fig. 3. Chart showing prominent symptoms.



Fig. 4. Girl aged 6. Injury at two years. Very little complaint for three years except limp. Exacerbation last year with development of flexion and subluxation.

up as an osteoporosis in the roentgenogram. Fever of one or two degrees is generally present but may be due to many other causes, especially in children; it should not, therefore, be taken too seriously. The von Pirquet test is of value, especially in young children, and should be used as an aid but should not be relied on to the exclusion of other means of diagnosis. The roentgen ray should always be employed but the picture in the early stages is not very definite; so much cartilage is present that the amount of destruction may be minimized in the plate (Fig. 4). The area near the epiphyseal lines in both the tibia and the femur should be closely scanned to determine whether or not there is a bony abscess which might be drained extra-articularly. Joint symptoms of a mild nature almost premonitory in character may be produced by these metaphyseal abscesses. The roentgen ray is of less aid in diagnosing tuberculosis of the knee in children than it is in the adult. If more than one joint is involved extreme caution should be used in diagnosing tuberculosis. The patient may be and generally is in good general physical condition. The

family history is important. Fraser, as I have stated, showed that in 70 per cent of the cases due to the human bacillus, a positive family history was elicited. Aspiration and intraperitoneal injection of the fluid or debris in a guinea pig is a very valuable test and should be used when practical. The occurrence of tuberculous glands of the neck, tuberculous peritonitis, or tuberculous involvement elsewhere naturally is evidence in favor of tuberculosis in the affected knee. Pulmonary tuberculosis is rare in children but when present is of serious moment.

DIFFERENTIAL DIAGNOSIS

Syphilis may simulate tuberculosis of the knee joint and not infrequently causes effusion in the knee but it is apt to be present in both knees. Careful questioning may bring out the fact that syphilis is or has been present in one or both of the parents. The child, and the parents in suspected cases, should have a Wassermann test although a negative test, if the clinical signs point more to syphilis than to tuberculosis, should not be accepted as final. Iritis and Hutchinson's teeth may throw the balance in favor of syphilis in an obscure case and should always be looked for.

An arthritis due to an ordinary infectious cause is usually more acute and rapid in its course. The more chronic form of infectious arthritis, in reality an arthritis deformans first described by Still and hence called Still's disease, may be confusing, but in such cases other joints soon show involvement and the patients are usually in a poor general condition (Fig. 5). General glandular enlargement and an enlarged spleen are common findings in Still's disease and are absent in tuberculosis of the joints.

Sarcoma of the lower end of the femur or upper end of the tibia produces joint symptoms, but on careful examination the enlargement will be noted in one or the other of these bones. A roentgenogram will definitely show the lesion and for this reason, if for no other, it should always be made in all affections of the joints or bones.

TREATMENT

The treatment may be roughly divided into general and local (Fig. 6). The fact should never be lost sight of that the disease being treated is tuberculosis and every means possible



Fig. 5 Infant, aged 20 months. Arthritis deformans. Roentgenogram shows synovial thickening. Indefinite diagnosis until year later when other joints became involved.

should be used to raise the patient's general resistance. Open air, sunshine, tonics, nourishing food, and congenial and at the same time sensible surroundings, should be insisted on. In several instances I have seen children, who in spite of all our efforts were in a steadily downward course, change to a steadily upward course on merely having their companions changed and sensible amusements substituted for those caus-

ing nervous strain. Tuberculous children are often precocious and may read books in too great numbers and fit only for mature minds. It may be necessary to take a firm hand and dismiss a fond parent as an attendant and substitute a less interested and more phlegmatic person. The best of local treatment may be of no avail if the general treatment is not carefully supervised.

The keynote to local treatment is conservatism. If treatment is instituted early and the proper means are taken to prevent the development of deformities, the management is easy. The patient coming late with subluxation and knock-knee and external rotation of the tibia is, on the other hand, most difficult to treat. A properly applied plaster of Paris cast affords excellent fixation (Fig. 7A and B). The ordinary stiff legged brace, in mild cases, is often sufficient. In the more acute cases rest in bed with extension may be necessary and when the patient is allowed to be up a plaster of Paris cast is indicated, with a high soled shoe on the opposite foot and crutches to prevent weight bearing. The Thomas extension splint (Fig. 8 A) is excellent, but unless guarded against is especially prone to cause a relaxed knee joint. As the condition improves, a walking caliper Thomas splint may be used (Fig. 8 B). All apparatus must be carefully supervised and care taken once the flexion is overcome to prevent genu-recurvatum. When subluxation is present more elabo-

Treatment of Tuberculosis of the Knee in Children

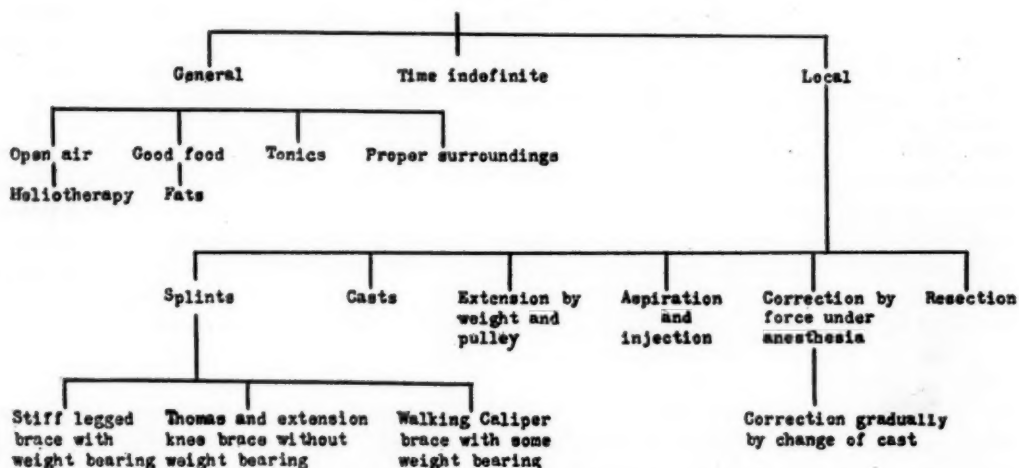


Fig. 6. Chart showing essentials of treatment.

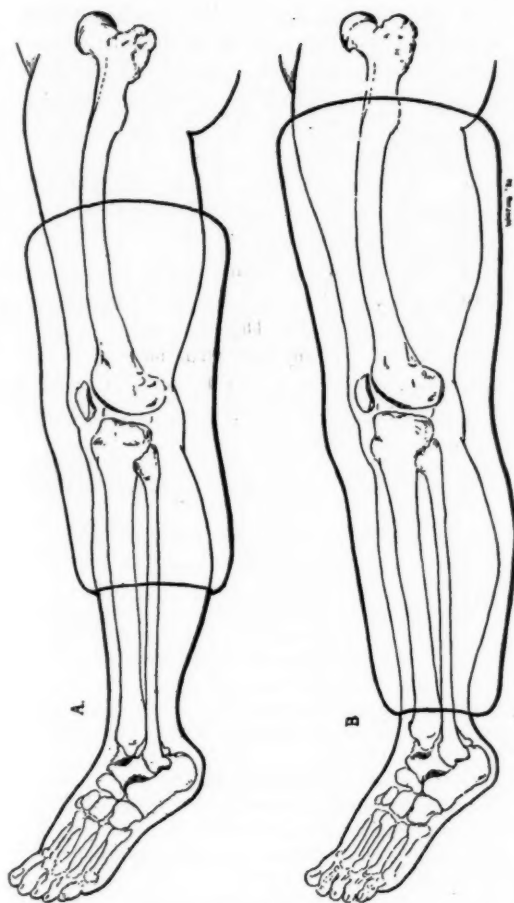


Fig. 7. A. Outline showing short cast giving poor fixation.
B. Long cast giving good fixation.

rate measures are necessary. Prolonged traction with weight and pulley, with the line of pull carefully directed, may straighten the knee. So many hindrances may be put in the way of this method, such as little tricks of the patient to lessen the pull, and kind-hearted but really meddlesome relatives and attendants who lift up the weights to ease the patient, that it may be better to give the patient a light anesthetic and gently force the knee straight. At the first indication of a tendency to further subluxation, the force should be stopped and a cast applied with the flexion deformity only partially corrected. This may be repeated and usually the knee can be brought straight in three or four attempts. The knee must never be moved back and forth, but

merely forced straight to the point where it seems safe. Not infrequently the knee can be brought down without the use of an anesthetic by merely applying a cast and at the end of a week or ten days removing it; at this time it will be found possible to obtain a few degrees more of extension, in which position a new cast is put on and the process is repeated until the knee is straight. This method always takes more time than when an anesthetic is used, and may be very slow and in some cases impossible.

Aspiration of the joint and injection with some antiseptic solution such as formalin in glycerin or iodoform in glycerin is ordinarily looked on with disfavor. In certain cases in which the effusion is extensive and the bony involvement apparently nil it may well be used. This should not be carried out with disregard to the proper mechanical measures to prevent deformity, but should be used only in conjunction with them.

It has never been our custom in the Mayo Clinic to resect tuberculous knees in children. Stiles has reported a large series of resections and the results have been astonishingly good. In America, however, we have not thought it necessary to resort to surgery. The type of tuberculous knee that is seen in the children in the Edinburgh clinic is more malignant than is seen in this country, and there seem to be very good grounds for the radical measures.

When the patient comes late in the disease with probable multiple draining sinuses the prognosis is poor. Fixation must be provided. Surgery only serves to spread the trouble unless there is a definite sequestrum. Heliotherapy, with general measures, offers the most. Under proper instruction, the child should be exposed to the sun's rays until the whole body is thoroughly tanned, care being taken not to burn the skin.

Tuberculin is used by some but there is considerable controversy over its value. Its use was abandoned some time ago in the Mayo Clinic as we could see no benefit from it.

The prognosis is reasonably good, especially if the treatment is started early and general and local measures are well and properly carried out. The question always asked by the parents is how long the treatment is to last. This can be answered only indefinitely; the parents should be

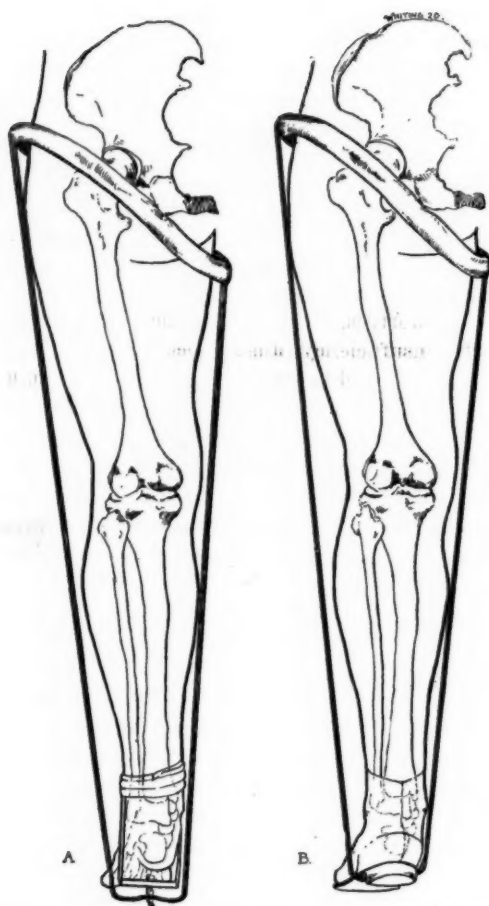


Fig. 8. A. Thomas extension knee splint showing ring resting on tuberosity of the ischium, thus giving a fixed point for extension.

B. Thomas walking caliper split with the irons fastened in the shoe and the heel just short of contact in the shoe.

told frankly that the treatment will mean years of observation and that a cure may mean a stiff knee, although many patients recover with considerable motion and a few with practically full motion. A proper understanding with the parents at the start will secure their confidence and understanding.

RESUME

1. Tuberculosis of the knee is always secondary to a focus elsewhere in the body and may be caused either by the human or bovine tuberculosis bacillus.

2. Trauma is a prominent etiologic factor.

3. The disease may be either primary in the synovia or in the bone. It is difficult to determine which is the more common. It is the impression of the author from clinical experience that the synovial type is fully as common in children as the osteal type.

4. The symptoms are usually mild and the deformity develops surreptitiously with but little complaint from the child.

5. The treatment is essentially conservative, and if instituted early, carefully planned, and carried to completion affords a good prognosis.

BIBLIOGRAPHY

- Brown, L.; Petroff, S. A. and Pasquera, G.—Etiologic studies in tuberculosis. *Jour. Am. Med. Assn.*, 1919, lxxiii, 1576-1578.
- DaCosta, J. C.—The causal relation of traumatism to tuberculosis. *Tr. Am. Surg. Assn.*, 1914, xxxii, 195-216.
- Fraser, J.—The etiology and pathology of bone and joint tuberculosis. *Jour. Am. Med. Assn.*, 1915, lxiv, 17-24.
- Henderson, M. S.—The intraperitoneal inoculation of animals; its diagnostic value in orthopedic surgery. *Am. Jour. Orthop. Surg.*, 1916, xiv, 320-326.
- Koch—Quoted by Stiles.
- Koenig—Quoted by DaCosta.
- Lexer, E.—General surgery. New York, Appleton, 1908, 1015 pp.
- Miller and Mitchell—Quoted by Fraser.
- Schuller, M.—Experimentelle und histologische Untersuchungen über die Entstehung und Ursachen der skrophulösen und tuberkulösen Gelenkleiden. Stuttgart, 1880.
- Stiles, H. J.—Pathology and treatment of tuberculosis of the bones and joints. *Jour. Am. Med. Assn.*, 1912, lviii, 527-534.
- Stiles, H. J.—Discussion on the after results of major operations for tuberculous disease of the joints. *Brit. Med. Jour.*, 1912, ii, 1356-1362.

DISCUSSION

DR. EMIL S. GEIST, Minneapolis: I wish to congratulate Dr. Henderson on his paper because it fulfills the requirements just as a modern woman's dress does, in that it was short enough to be interesting and long enough to cover the subject. (Laughter.)

When I see a patient afflicted with tuberculosis of the knee or other forms of joint tuberculosis, I ask why? We now have two ways of infecting children, either by means of some patient who has an open tuberculosis, or from inadequate supervision of milk supply. Every case of joint tuberculosis in a child is really unnecessary and means that in some way or another a mistake has been made in the surroundings of the child or on part of the health authorities.

I am sorry Dr. Henderson did not mention the differential diagnosis of tuberculosis of the hip joint.

A case comes in with a beautiful cast on the knee while the disease started in the hip joint. The thigh being atrophic makes the knee look larger and swollen. It is not an uncommon thing to have this happen and it is rather difficult to explain why that cast is on the knee and not on the hip. The first picture showed of blood vessels in the knee joint explains that.

Another reason why these children should have tuberculosis of the knee more often than adults is because there are more blood vessels growing in the knee joint of the child than in the adult. Lexer's studies show very nicely how the number of blood vessels in the adult knee joint is much less than in the knee joint of the child. Of course, the more blood vessels, the more bifurcations, the more chance there is for embolus and all that sort of thing.

Conservative treatment is the thing in tuberculosis of the knee joint in children; at the same time, operative treatment must sometimes be resorted to.

Regarding resection, I happened to have in Paris about ten years ago immediately following an epidemic of resections of knee joints. In other words, children at the age of eight or twelve had their knee joints resected, and I saw those cases twenty-two and twenty-four years of age with their legs eight or ten inches shorter than on the other side. Resection involves the epiphysis. The active growing centers of the leg are situated about the knee joint, and resection is an operative procedure which, if done at all, must be done with the idea of conserving the epiphyseal cartilage. If an operation is to be done, I think the new operation of Dr. Hibbs, of New York, whereby he fixes the knee by using the patella as a graft, taking out the patella, making a place for it between the tibia and femur, and embedding the graft in there, making a bony bridge across from the femur to the tibia, and not involving the epiphysis should be done. This can be done in children who are ten or twelve years of age who have the very virulent type of tuberculosis that Dr. Henderson mentioned. Dr. Hibbs told me a few weeks ago he was doing that operation on this class of cases and has seen no reason to regret it. Operative treatment in tuberculosis of the knee in children will occupy a rather small but definite place in surgery.



A STUDY OF CHEST CONDITIONS ASSOCIATED WITH AORTIC DISEASES, SPECIFIC AND NON-SPECIFIC*

By E. L. TUOHY, B. A., M. D., F. A. C. P.
Duluth, Minn.

This paper will deal with an analysis of a group of cases classified primarily as aortic aneurysm, aortic aneurysm with aortic insufficiency, syphilitic aortic insufficiency, syphilitic mesaortitis, rheumatic endocarditis with aortic insufficiency, angina pectoris, and miscellaneous mediastinal conditions simulating aortic disease.

We will find that as far as etiology is known we will deal chiefly with the results of (a) Syphilis, (b) Streptococcus or Rheumatic Infection, (c) Chronic Degenerative Vascular and Myocardial Changes. Statistical data will be given on the two latter groups, chiefly to accentuate and compare them with the first, which is virtually the chief subject of this compilation.

In those conditions known to be due to syphilis, or in which we can prove it to be the cause, the absolute advantage and need of an early diagnosis is beyond cavil. On the other hand, a word of caution is needed not to overwork it in assigning it as the cause particularly in the groups classified above as (c). Our statistics of true major angina, for example, will not confirm the often expressed relationship to syphilis; they fall in a later decade of life, and occur with a different pathologico-anatomical complex. Our possession of incomparable therapeutic weapons to overcome the destructive propensities of the spirocheta pallida is only equaled by the amazing faculty of this organism to insinuate itself and devise its own protection. An apparently simple and evanescent "soft sore" at twenty can be the true source of aortic aneurysm at seventy.

Nothing exemplifies better our changing standards than an historical survey of syphilitic aortic disease. The principle is not confined to any special field in Medicine, as witness the means now at our disposal to identify duodenal ulcer. Compare our present knowledge of the incidence and importance of that condition with

*Read before the Minnesota Academy of Medicine, May, 1920.

the teachings and practice of a scant twenty years ago. In changing from period to period, courage and conviction are necessary to cast off any of the traditions of the past, for fear lest in the mass of straw a few precious kernels of wheat might be concealed. Hence we have our massive and unwieldy text books and medical systems; the best excuse extant for our ever increasing periodical literature.

THE INFLUENCE OF ROENTGEN-RAY AND SEROLOGICAL STUDY

The development of the X-ray and perfection of the fluoroscope, together with the Wassermann blood test, have done for the study of syphilitic arthritis what many specific tests previously have done for other diseases: they have put into the background the elucidation of a great mass of less definite data. The distinct loss arising from the failure of younger clinicians to train their faculties and perceptions in the older lines of "physical diagnosis" is at least in part overbalanced by the enormous advantage accruing to the patient, through earlier and more accurate diagnosis. The tendency, however, is not without its critics. Hoover¹ has recently challenged an editorial in the *A. M. A.*² which stated briefly, that aside from early Roentgen signs and serum findings, early specific aortitis awaited a reliable means of identification. Even accepting Hoover's proposition at its face value, and acknowledging all the claims, we only need refer back to his statement that "The older established methods of bringing out physical signs serve equally well as the newer diagnostic criteria". We are confronted then, with the conclusion that the skill needed in the interpretation of the signs he mentions depends so greatly on personal factors, the cultivation of particular senses in the examiner, as to render decisions by those less skilled liable to error and faulty judgment. In other words, while instrumental data and laboratory technique may lead us away from intensive individual development, they are fortunately subject to standardization and therefore to a wider and more universal usefulness. We may state unequivocally that the Roentgen-ray is indispensable in modern chest diagnosis, and it is fit and proper that the clinician should know fully its possibilities and its limitations.

The laboratory tests for syphilis no longer

need defenders, and in searching for the earliest evidence of syphilitic invasion of the aorta we may well heed the words of Elliott³: "From the practical clinical standpoint accumulating evidence is forcing the conclusion that a persistently positive Wassermann reaction in a patient without evidence of syphilis in the skin, mucous membrane or nervous system, points to the aorta as the next, most probable seat of the disease". In speaking of sub-sternal oppression or pain in a middle aged individual, Schneider⁴—"Should be proven clinically, radiologically, serologically and therapeutically to be free of syphilis". Our own experience abundantly affirms the correctness of both of these statements. The extent with which the X-ray and properly safeguarded Wassermann tests are used, is of far more than academic interest; because the life and efficiency of a very large number of people depend upon the accuracy and intensity with which the average doctor examines the average patient. There are few disease states in which the pathology has been worked out so definitely as syphilitic aortic disease. Yet, at the two extremes—its terminal stage and its incipency—there are few conditions more often misjudged; aortic aneurysm in its various stages masquerades as bronchitis, asthma, tuberculosis, malignancy, etc.; or, in those with beginning sub-sternal oppression and in the curable stage are either designated a neuralgia or a neurasthenia.

Little mention was made of the use of the X-ray in diagnosis until about 1905. Babcock's book⁵, published in 1903, refers to the X-ray as "useful in certain cases". Salinger's translation of Leube⁶, scarcely mentions the X-ray at all. C. L. Green's diagnosis⁷, published in 1907, ends the discussion strikingly by stating: "The last 20 cases of thoracic aneurysm coming under the Author's attention, have been subjected in each instance to the X-ray, and without it fully 50 per cent would have gone unrecognized". Osler himself wrote the article for "Osler's Modern Medicine", published in 1909. In it he devoted 52 pages to a discussion of the general aspects of the disease, and only one brief page mentioning the possibilities of the X-ray. He had, however, the great gift of prophecy, and evidenced it by dividing his

discussion up into an analysis of (a) Aneurysm of Symptoms; (b) Aneurysm of Physical Signs. He clearly grasped the proposition that the early symptoms long antedated, as a rule, the disastrous ultimate structural change. But not until the period of 1910-1912 did the Wassermann test begin to figure prominently in statistical tables, and to furnish a connecting link between clinical histories, physical findings and post-mortem results.

THE INFLUENCE OF ALLBUTT'S BOOK

Few books have been so deservedly widely read as Clifford Allbutt's "Diseases of the Arteries, Including Angina Pectoris". This compilation is remarkable not less for its amazing wealth of references to the literature than for the opinion and observations of the author. The work has certainly not lacked reviewers, not all of whom agree with the writer; but he has not failed to impress his point: the decided influence of disease in the aortic wall in the production of that very definite something known as angina pectoris. From the standpoint of national conflicts, as evidenced even before the great war, it is of interest to read his tribute to the "Kiel" school and "Dohle-Hellersche Aortitis". Gradually as he proceeds he comes to refer to the dilated syphilitic tube as the "Hodgson-Welch Aorta". It is indeed well for us to know that an English speaking doctor, as early as 1876 accurately, if not elegantly, described the condition, and his name is now most often associated with the disease. Nevertheless, Allbutt's monograph on aortitis has a huge number of references to German speaking investigators, and despite the difficulty of repressing our strong international disgust, we must be willing to acknowledge their great worth. They were early in making the routine use of the Wassermann test, and should, with the French and the Americans, be given credit for the early use of the X-ray in chest diagnosis. More than these things they were early in doing detailed and accurate autopsies. Gruber's monograph" in 1914, on Dohle-Hellersche Aortitis, is a good example of the clinical adaptation of pathological knowledge previously developed: of 120 cases, with 27 autopsies, the Wassermann reaction was positive in 100; only 41 gave a history of having syphilitic infection. Such reports with similar findings soon multi-

plied until it came to be generally assumed that all aortitis was likely to be syphilitic and that all aneurysms should be associated with a positive Wassermann reaction in the blood. In general, it is likely that American writers have failed to find as much evidence of non-specific aortitis as one might assume occurs in England, from a perusal of Allbutt's book. To this, and several other matters of unusual interest, I will presently bring forward such evidence from my own records as has a bearing on the subject. In the meantime, in a field so full of interest and consequent distractions, we must coerce ourselves into focusing our attention on the main factors.

PATHOLOGY OF AORTIC DISEASE

We seem to know as much about syphilitic aortic disease as we can likely hope to know, unless we should be given ultimately a specific preventive or a more specific cure. With this in mind, we might devise a set of postulates, stating that a disease to challenge our utmost capacity and public duty, should offer:

- (1) A known specific cause and technical methods enabling its identification and its experimental use (animal inoculation).
- (2) Its pathological imprint on the tissues should be identifiable.
- (3) It should admit of clinical diagnosis and differentiation from conditions producing similar changes.
- (4) We should have a prevention and a cure.

Little amplification is needed to bring out these features as applied to syphilitic disease of the aorta; the features of interest all co-ordinate.

We may pass over the first statement with the remark that the skillful use of the dark field method, in the time requiring two generations to move across the stage of life, should do for aortic aneurysm what vaccination and water purification have done for typhoid fever. In that day there will be no mention of harmless, penile sores.

The pathological imprint on the tissues is unmistakable, and despite its familiarity merits repetition. The well known perivascular inflammatory infiltration, via the vasorum of the aorta, gradually cuts off these small vessels. The more or less persistent gummatous in-

vasion, despite apparent periods of latency, results ultimately in weakening and dilatation. There is every reason to believe that the acute round cell infiltration indicative of activity is by no means as resistant as the connective tissue resulting when active infection is subdued. The typical aorta when viewed shows insunken, depressed areas, corresponding to the different degrees of media thinning the raised edge is due in part to some proliferation of the intima. The aortic ostium is affected in a three-fold manner: (1) It causes adhesion of the valve cusps to the aortic wall. (2) Separating the cusps at their periphery, and allowing a maximum of regurgitation. (3) About one-fourth inch from the plane of the valve it produces a scarring and a swelling that tends to gradually close the coronary arterial opening. The first two are constant evidences of syphilis; the last occurs typically in syphilis, but may occur in certain non-specific inflammation. The coronaries in their course are never plugged by syphilis, and like the peripheral vessels seem to escape. Where the heart is affected by gumma, the aorta is apt to be free*. Aortitis as a rule, precedes the valvular involvement. So definite is this pathology**, that even though decidedly overgrown with atheroma and intimal changes, the true cause can be distinguished. I recall seeing at autopsy a calcareous cast of the entire ascending aorta, with a definitely dilated tube. Nevertheless, stripping off or cutting through the surface, characteristic media changes of syphilis could readily be distinguished. To Allbutt are we indebted for assigning to the intimal changes their very minor influence on hypertension and allied disorders.

Atheroma is really a form of decay, seen earliest in the aorta as a rule near the base of

the valve cusp, and not crippling it. The surface fatty degenerative plaque is usually underlaid by a chalk deposit. Rheumatic or streptococcal infection also singles out the aortic cusps, but when it does it never attaches them to the aortic wall, although they may adhere to each other. The valve cusps are prone to shrink in their radial axis, and leave an opening in or near the middle. Stenosis is impossible with a purely syphilitic valve; it is quite likely with a severe rheumatic. In the latter the mitral cusps rarely escape involvement also.

CLINICAL DIFFERENTIATION

Identifiable clinical data conform unusually well to those pathological differential criteria. The age incidence becomes of paramount interest, and certain rather dogmatic statements become quite justifiable. (1) Any uncomplicated aortic insufficiency coming on after 35 is probably syphilitic. (2) Rheumatic aortic insufficiency occurs at a much earlier age period, and is usually found unassociated with mitral disease. (3) Sudden death from aortic insufficiency occurs at an age period which those with early rheumatic etiology are not apt to attain. The "cor bovinum" is an unstable organ. But, just as it is possible to have a combination of striking atheroma and syphilitic disease of the wall, we may have a combination of rheumatic and syphilitic disease of the aorta and valves. I wish to report the striking features of such a combination.

Male, aged 46, first seen five years ago. He had been ill about two months with acute endocarditis, with some shifting arthritis. I saw him in consultation with Dr. C. H. Mason of Superior, Wis., under whose care he proceeded to good, fair recovery. When the acute symptoms had subsided a mitral and aortic insufficiency were very apparent. Reasonable compensation supervened, and the man went back to fairly heavy work.

Now within a year, I have re-examined him; he has a large thoracic aneurysm, a positive blood Wassermann. He admits having had gonorrhea, but denies chancre. In all probability, his aortitis was present even at the time he had his acute rheumatic infection, and the one condition was superimposed on the other. This is not an uncommon association post-

*I recall several years ago doing a coroners autopsy on a man aged 36, who had left home in the morning perfectly well. His family did not know he had been at all sick. He dropped dead on his way home to lunch. At autopsy a large gumma was found occupying the apex of the heart and part of the interventricular septum. His aorta was perfectly free.

**This has been written up so often that one hesitates to reiterate, but article after article is read wherein the writer has not made himself clear or has a misconception of the facts. A good illustration is a recent and otherwise excellent article (Tyler, A. F.: Syphilis of the Great Vessels; Am. Journ. of Syphilis, Vol. IV, No. 1): "The Pathology found is—that of the Syphilitic Plaque, followed by a weakening of the wall.—The aneurysmal sac is made up of intima and an adventitia—the media not being present. This is due to the fact that the media has ruptured under pressure from within, and the more tenacious (?) inner and outer coats withstand the stretching (?). (All abbreviations and italics are my own additions.—E. L. T.)

mortem. I simply wish here to point out that clinically the differentiation can also be made.

So called "Atherosclerosis", represented, as it is chiefly by intimal degenerative changes, can be objectively demonstrated, either by palpation of the superficial arteries or by a study of the eye grounds, or a Roentgen visualization of some artery technically demonstrable, such as the posterior tibial or the dorsalis pedis. This latter procedure has been routine in our examinations for some time in conditions such as intermittent claudication, true angina, diabetes, or other trophic disturbances of the extremities. In many instances Roentgen plates show delicate, intricate structural detail, pointing to the general degree of arterial degeneration. In fact, there are some plates of the chest that seem to show shadows arising from the intima of the aorta.

PHYSICAL SIGNS

A study at this time of most of the methods other than Roentgenological for determining the degree and amount of dilatation or lengthening of the aorta is quite profitless. So many signs have departed with that euphonious and alliterative rarity, the "tracheal tug". No doubt Hoover is right in holding to the value of Huchards' early teaching and this would be particularly true if it were all we had. But, palpatory and percussion signs of minor degrees of either aortic dilatation or elongation, are extremely elusive, and most of us might better admit it. The conformity of the chest varies so much, and the subject whose chest is best adapted to normal percussion and palpation is not the one who may have the disease. In the same manner, any kind of uncomplicated systolic murmur, particularly at the base of the heart, is strikingly suited to stimulate the wildest imagination. For the time being, at least, until our knowledge is greatly furthered, systolic murmurs as unassociated signs, should be practically disregarded. On the contrary, diastolic murmurs, as has been so often said, are full of meaning. Curiously enough, some of these minor ones are best heard with the unaided ear in contact with the chest wall. Further than the well known differentiation, based on diastolic murmurs at the base, in the customary areas, the next most valuable differential point is the quality of the tone. Quite

as important as the character of the sound, is the position where it is heard. Potain is credited by Allbutt with attempting to vivify the tone by likening it to that produced by an Algerian drum—the "bruit de taburka"*. On the other hand, the measuring of sounds and their interpretation, is almost altogether subjective. It is curious how difficult it is to decide by the character of the tone either the position the aorta occupies in terms of the chest wall, or the degree of tension within its lumen. Hoover's contention that it is practically altogether a question of how close the aorta has come to the chest wall and the amount of tissue intervening, is somewhat borne out by a patient recently examined with an extensive tuberculous infiltration proceeding from the right hylus up into the upper lobe. On forced expiration the second aortic tone would be said to be normal; after deep inspiration there seemed to be enough traction to the right to produce a tone very closely simulating the bruit de taburka. In weighing this important source of evidence it is fortunate that we do not need to rely on it exclusively. Syphilitic mediastinitis is apt to be an unconsidered part of most syphilitic aortic pathology. This probably accounts for the fixation other than pulsation, so that the hint that auscultatory and percussion findings in syphilitic disease are not so liable to respiratory influence, is correct.

ROENTGEN EVIDENCE

A recent article by Martin¹ from the Roentgen-ray Department of the Massachusetts General Hospital, summarizes well the roentgen possibilities and gives the results of their studies. Using a standard distance of 7 feet from the plate, he reports the distance from the right border of the ascending aorta to left border of the descending aorta to be between 4.5 and 6 cm. Chronic endocarditis, arteriosclerosis, syphilis, hypertension, high diaphragm, and dilated pulmonary arteries, are discussed as agents distorting and widening its normal shadow. The reader is urged to consult the original article because it gives a good, fair, working standard.

With plate confirmation, a man well trained

*I have on a number of occasions been struck by the remarkable features of this tone, and have made correctly a provisional diagnosis of aneurysm in the early stages of the examination.

in the use of the fluoroscope should not overlook any definite variation in the shadow of the great vessels. It is rightly not expected of the radiologist to always be able to give a specific cause of the shadow increase. Yet, the prominent knob at the upper left is indicative enough of arteriosclerosis, and certainly the bulging to the right in the region of the ascending aorta is with very few exceptions syphilitic. The time is here, however, when the patient's history and the entire clinical concepts will be associated in the production of an accurate diagnosis. So prominently does syphilis enter into the causation of the widened aorta, that it behooves us to devote more attention to the differentiation of those that are due to something else. An accidental combination of arteriosclerosis with hypertension should theoretically give a combination that would tend to develop a uniformly dilated aortic tube. Fortunately, I have one such case, very thoroughly studied, which I am satisfied shows a rathered marked aortic stretching, that is due to this combination.

Mrs. T., Aged 59. A presenile woman, showing a greatly shrunken skin and generally undernutrition. She has bilateral cataracts, and presents a rather forlorn appearance. The blood pressures are 130 diastolic and 260 systolic. From the kidney standpoint, she has nocturia, a trace of albumen usually, with a few casts, a P. S. P. output of 50 in 2 hours, and blood test showing no evidence of retention of nitrogenous end products. She has been diagnosed as a "kombination" form of nephritis. She is a thin, fair individual, and the chest plate shows clearly enough definite aortic dilatation in both the ascending and descending portions. She has repeatedly negative Wassermanns.

Our studies on hypertension (F. J. Hirschboeck²³), confirm the general assumption that syphilis cannot be considered more than a minor agent in its production. It is said that syphilitic aneurysmal dilatation will give a denser shadow than the simple dilatation due to arteriosclerosis. The plate in this case would tend to lend weight to that observation.

It is well known that hypertension alone, possibly as Martin²⁴ states, when associated with a high diaphragm will produce a widening of the great vessel shadows. Numerous in-

stances could be brought forward to support this contention. The various combinations of cardio-renal disease and possibly late arteriosclerosis, are prone to be intimately mixed, and it is very certain that the roentgen evidence must be considered a part of the whole. Studies of the patient in the oblique position and a proper interpretation of the aortic knob, the questions of pulsation, posteriorly as well as laterally, heart fixation or displacement downward to the left, conformity of the spine, are all technical but very important points.

The influence of mitral disease in changing the basal shadows, will not be considered in this article. Four instances of congenital heart disease, which were diagnosed either as a pulmonary stenosis, patent ductus Botali, or simply labelled "congenital heart disease", leaving the lesion undetermined, were cases with such unmistakable clinical signs, as to make the condition difficult to confuse with the processes under consideration.

MEDIASTINAL THICKENING

Concerning the mediastinum, there are many points of unusual difficulty that arise. Ruling out substernal thyroid, the thymus gland, and acute mediastinal inflammatory accumulations, we have to deal chiefly with syphilitic, tuberculous and malignant disease. Syphilis has been studied, as a primary source of mediastinitis by Giffin²⁵ and others, but as has already been mentioned, it is a usual addition to a syphilitically diseased aorta, and in many cases of aneurysm is a very destructive association, complicating the diagnosis and inducing changes in the bronchi or lung, confusing our ordinary standards.

G. R., a woodsman, male, aged 43, was under our care off and on for three years. At autopsy we found a very large aneurysm, eroding the spinal column. To summarize only the crucial data: During the pre-aneurysm formation period, he had numerous negative blood Wassermanns. Yet a physician who had treated him six years previously for an "enlarged liver" and "ascites", said he lost all his symptoms under anti-specific treatment. Under my care his chest pains and a slight degree of hoarseness responded quite well to a short course of anti-specifics. Later on, in the course of his disease, and when the aneurysm had al-

ready formed, the roentgen evidence was as misleading as the serological had been in the beginning: he developed what his attendant called a pneumonia; thereafter his decline was persistent and rapid. Our roentgen findings were identical with those of the Mayo Clinic, where he was also examined during that stage of his illness. A report from Dr. R. D. Carmen reads as follows: "The X-ray finding was fluid filling the entire left chest; the urine, sputum and Wassermann tests were negative.—Aspiration in the eighth interspace was negative.—An incision was made down to the pleura; there seemed to be a slight amount of movement underneath.—The fragment removed for microscopic diagnosis was negative.—There was nothing in his findings to suggest aneurysm during his visit here." Our pre-autopsy diagnosis was malignancy, arising from the mediastinum. We found a large dissecting aneurysm of the descending aorta, eroding into the vertebral column and strikingly encased by it. The left lung was as hard and as firm and dense as liver, and when the specimen was X-rayed, attached to the heart, showed a denser shadow than the heart itself. Passing the finger into the left pulmonary vein, a point of compression and closure could be easily made out. The lung, grossly and microscopically, showed nothing more than an intense passive congestion.

Here we have the striking evidence, with autopsy confirmation of a failure both of the Wassermann and the Roentgen-ray to properly identify the condition.

A striking case of tuberculous mediastinal infiltration concerns a male, aged 48, who had consulted numerous physicians and hospitals. He had evidently had an old pulmonary tuberculosis, later a hypertrophic arthritis deformans complicated the picture; but ultimately an interference with the return of the venous blood from the superior vena cava gave most startling venous enlargement of the veins in the neck and trophic disturbances in the right upper extremity.

This sort of process would naturally be expected in a fibrous or shrinking type of tuberculosis, chronic and persistent in its course. More difficult of differentiation are some of those cases in young children, presumably hav-

ing large masses of tuberculous gland elements at the bifurcation of the bronchi and thereabout.

Primary malignancy, including Hodgkin's disease, is accountable for more conditions of the true mediastinum proper than either tuberculosis or syphilis. In the way of differential diagnosis, the patency or distortion of the oesophagus, as determined by the usual methods, yields practical aid. Several cases of supposed malignancy we have observed run a very chronic course, and unfortunately, autopsy confirmation has been withheld. In these cases one is always left with the uncertain feeling that despite negative findings they might still be syphilitic, and that at least a therapeutic trial is merited. In general, we should remember that despite our so-called specific methods, the therapeutic tests for syphilis is just as good now as it was at a time when it was the chief standby of the clinician.

THE PRESENT STANDING OF THE WASSERMANN TEST

Three patients in this series deserve unusual consideration. **All three were observed carefully at a time when in the course of a general examination the Wassermann was reported positive.** Nothing was found, either in the history or physical examination, to account for the positive finding. Two of them only had a moderate amount of treatment, and the third had none. Yet, within a period of three, five and six years respectively, they all return with definite aortic aneurysm, two in the ascending portion and one in the descending. Despite all that has been said about the danger of taking a positive blood Wassermann too seriously, experiences of this kind are apt to weigh very heavily with the conscientious physician. I am inclined to believe that we are prone to accept negative blood findings altogether too seriously. There are known to be a considerable number of late aortic aneurysms even, with negative blood findings. The use of provocatives to stimulate positive reactions is probably also less conclusive than previously held. Even negative tests in the spinal fluid must not be taken as conclusive evidence ruling out syphilis. If this has been demonstrated in true disease of the cerebrospinal nervous system, how much more so should we be cautious in accepting

DIAGNOSIS.						Social Status		Syphilis Admitted	Blood Wass.		Cough			Substernal Oppression	Dyspnoea			Bronchitis & Cough		Angina Varying Forms		Died	Fluorosc.				
						Married	Single	Affirmed	Negative	Positive	Negative	Not taken	Severe	brassy	Moderate	Absent	Present	Absent	Severe	Moderate	Absent	Present	Absent	Present	Absent	Positive	Negative
A Aortic Aneurysm	18	2	49.4	25	62	15	5	4	16	12	5	3	7	6	7	18	2	8	3	9	11	9	4	16	11	20
B Aortic Aneur. & Aortic Insuf.	5	0	54	35	66	3	2	1	4	3	1	1	3	1	1	4	1	4	0	1	4	1	3	2	1	5	0
C Aortic Insuf. Syphilitic	4	1	45	30	62	4	1	2	3	5	0	0	0	2	3	4	1	5	0	0	2	3	3	2	1	CH [†] 5	0
D Aortitis Syphilitic	7	0	38.5	28	59	4	3	2	5	7	0	0	0	0	7	7	0	5	2	0	0	7	?	?	1	2?	5
E ¹ Aortic Insuf. Rheumatic	8	10	27½	14	15	9	9	0	0	0	0	5	0	0	16	2	16	15	0	3	0	18	0	18	5
E ² Aortic Insuf. & Mitral Insuf.	9	2	32.5	15	57	6	5	0	11	0	5	6	0	0	11	0	11	3*	0	8	0	11	0	11	2
F Angina Pectoris	13	2	62	49	74	14	1	0	15	0	7	8	0	3	12	15†	0	7	0	8					8

*Amount of, dependent on state of compensation of heart.

†Differentiation of character of pain is made in body of article.

‡C H (Cardiac Hypertrophy.)

negative spinal fluid as being determinative for lesions elsewhere. More will be said on this subject in the discussion of the cases of aortitis.

CLASSIFICATION OF CASES

A table is shown, dividing the cases that have been observed into certain groups, with the usual age, sex, social status, and dominating symptoms graphically shown.

Groups "A" and "B": (both aortic aneurysm and aortic aneurysm associated with aortic insufficiency will be considered here together). Of the 25 cases, 23 were males; 18 married and 7 single. Of the 10 who had children, a total of 28, 7 belonged to a man who contracted his syphilis, however, after his wife died, and there would be no suspicion of hereditary influence on his family. The remaining 9, therefore, had a total of 21 children. Syphi-

lis was admitted by only 6, and denied by 19. The Wassermann positive in 16, negative in 6, and was not taken in 3. The average age 54.4, the oldest being 66 and the youngest 35. There was only 1 doubtful case, in which there was a fair history of rheumatism, but with a positive Wassermann. The cases were observed for a period varying from 1 to 5 years, with an average of 1.5 years. Eleven died, and 6 autopsies were made, all showing aneurysm of the ascending and arch of the aorta, except 1 in the descending aorta. Nine are still living, and show some improvement. Five are current and severe, and show no improvement. The fluoroscope gave positive evidence in all except the 1 doubtful case above mentioned. Ten were in the ascending aorta, 9 in the arch (usually involving some of the ascending aorta as well), 2 were in the descending aorta, 1 distinctly ab-

dominal with a mass protruding below the ribs, and 3 designated as diffuse. Five, as noted in the table, were associated with a definite aortic insufficiency.

LEADING SYMPTOMS

Cough, dyspnea, substernal oppression and varying degrees of pain (angina) were most marked when the brunt of the dilatation was at or near the arch. Nevertheless, one of the cases of aneurysm of the descending aorta gave the most excruciating pain. Recurrent laryngeal involvement, with a brassy, characteristic cough, was observed in 7. An analysis of the cough is difficult, because it varies with, and depends on, the associated bronchitis or degrees of pressure. The change from time to time, dependent on the faulty drainage, associated infection, etc., must vary the amount of cough from period to period. Substernal oppression and the degree and extent of pain certainly seem to go hand in hand, but in only 2 cases could the type of pain or distribution be said to stimulate in any definite degree true major angina. Six cases, despite the position of the aneurysm, gave the seat of their distress in the epigastrium, and suspected stomach disease, suggesting that some of the earlier signs of aortic disease, like that of the heart, may be gastric. As isolated symptoms, 9 had severe cough, without much chest pain or oppression; in 3, dyspnea occurred only after considerable excitement and effort, despite a very large aneurysm in the supra-sigmoid region. Naturally, those associated with aortic insufficiency had the greatest degrees of dyspnea arising from exercise, and were not so associated with either cough or substernal oppression. In these specific aortic insufficiencies, cardiac hypertrophy was not found to the degree usually encountered in the non-specific type. Myocarditis, while present in most of the late cases, was not mentioned in the beginning as having any influence in 16 cases. A rheumatic history was given in only 2 cases that seemed reliable: 1 is mentioned above as an association of both rheumatic and syphilitic disease, and in the other the diagnosis is still questionable. Rheumatism was alleged in 6, who thought that their chest pains were rheumatic in origin.

Two had tabes; 1 a gastric syphilis with hour-glass contracture; 1 a definite ophthal-

moplegia externa; 1 a severe postoperative abdominal hernia; 1 severe abdominal pain associated with attacks of jaundice. The diagnosis lies between gall bladder disease or a gastric crisis, and probably is the former. Four had leg ulcers, thought to be syphilitic, that responded to treatment.

SYPHILITIC AORTITIS

This term is rather loosely used. What is meant is the aortic wall involvement before aneurysmal change has taken place. This number here included might be made much larger were a little more courage available. The term has been held down rigidly to include only those having: (a) substernal oppression, usually increased by exertion, and some pain; (b) a general sense of incapacity usually out of proportion to any demonstrable physical perversion;* (c) persistent positive Wassermanns in the blood; (d) decided improvement under anti-specific treatment.

Of the 7 cases, all were males; the oldest 59, the youngest 28, the average 37; 4 were married and 3 single. No rheumatic histories nor evidence of endocardial involvement found. All improved markedly under treatment except one, who took almost no treatment, and had a tragic death, presumably due to coronary closure. He had foresight enough, however, to get a very large insurance policy a relatively short time before he died.

Three cases spoken of under "Aneurysm" certainly were aortitis when they were first observed, but they were not catalogued as such until outspoken aneurysm was present.

We should be very slow to try to explain away positive Wassermanns, and equally loathe to accept negative blood findings as determining whether a patient needs treatment or not. This must be our attitude until such time as known syphilites have tattooed into either their memory or their skin a permanent record of what has been known concerning them or what treatment has been given, and the reasonable diagnosis made at the time. There would still be, of course, a large number of individuals who acquire syphilis and have no knowledge of its early implantation. Yet, we would go a long

*Allbutt's contention that the pain arises from subadventitial irritation seems to receive general support.

way if the known cases* would carry around with them as one of their priceless treasures a document similar to an army discharge paper, giving in detail a history of their case and the amount of treatment they have had.

RHEUMATIC AORTIC INSUFFICIENCY

Twenty-nine cases, for purposes of comparison, are studied as to their symptomatology. Eighteen were diagnosed as a primary aortic insufficiency without mitral involvement, and this seems higher than the usual statistics given. The history and the age, however, conform to the usual standard: the youngest included is 14 years, and the oldest 57. The age average of the pure aortic insufficiencies is 27.3, and of the entire series 32.5. Two patients unusually well along in years for their respective lesions, raised the average considerably higher than it otherwise would have been.

Aside from cardiac hypertrophy and the types seen, the roentgen evidence would be said to be negative. The same is true of the Wassermann test, and certainly none of these could be confused in the presence of striking objective symptoms with the syphilitic individual, with his disease confined to the aorta.

ANGINA PECTORIS

Fifteen cases, the average age 62 (the youngest 49 and the oldest 74), have been tabulated. Only two of the patients were females. It will be noted that the fluoroscope, as well as the Wassermann studies, have given negative results in all.

The intensity of the substernal pain and oppression was classified into four degrees, the degree being determined by the most severe of the attacks experienced. Numbering the groups I, II, III and IV, in degree of severity, all in Group IV had a sudden and tragic death. Three in Group III had sudden deaths, and one died of myocarditis and cardiac dilatation, the attacks letting up as soon as the heart muscle gave way. It is of interest to note that the remaining two groups all had hypertension of moderate degree, and would easily be classed as a possible stenocardia. In none of those dying suddenly had there been a hypertension.

Of a large number of syphilitics studied, none

as yet has produced a patient with Group IV type of pain. Allbutt maintains that most patients with the true major angina, under 45, are probably syphilitic, and this appears to be sound reasoning. Not much comment would be made at this time were it not for the fact that we so frequently hear in stentorian tones the implication that syphilis is the chief source of angina pectoris. Such is the amazing and long enduring result of the courageous if not cautious experiment of John Hunter! It will simplify matters a good deal if we realize that angina pectoris or sudden death in the middle aged or relatively young may well result from syphilitic aortitis, and, that our ordinary male in later life, exhibiting the tragic, prostrating, grinding reminder of the grim reaper, will show the objective evidence of intimal degeneration. Now, whether this intimal process will concern the coronaries, or the aorta itself, or the coronary ostia, evidently means less in the production of the disease syndrome than it does in determining the nutrition of the myocardium. In brief, one need not expect to make an etiological diagnosis from a study of the intensity or the distribution of the pain; a routine study will show in most cases over 45 that the process is based on a primary arterial decay.

To properly safeguard those who have a generalized syphilis, more or less inactive, against the late structural degenerations of the aorta, is the great problem of the medical attendant. To be sure enough that syphilitic aortitis is present, so that proper treatment will be given, before objective changes are determinable, requires judgment and a sincere interest in the welfare of the patient. Careful histories, and still more careful serum studies persistently made, are invaluable. But, where valuable time has been lost and structural changes are already present, the time has come when we must avoid inefficient and meddlesome treatment, and give the most intense therapy that the patient can safely stand.

For the time being this brief reference to treatment is all that will be made. Our older conceptions of latency in syphilis must be modified. More or less active gummatous lesions occur in the aortic wall over very long periods. Replacement by connective tissue, firm and strong, is far preferable, as has been pointed

*The recent work of boards of health, including our own State Board of Health, is an excellent start in this direction, and physicians should cheerfully co-operate.

out before, to the loosely structured round cell infiltration. The treatment eliminating the gumma will at the same time constitutionally support the patient, and usually rid him of numerous lesions elsewhere. What is needed is a conscientious, scientific, early diagnosis; to be followed by an equally logical, intensive and persistent line of treatment.

REFERENCES AND BIBLIOGRAPHY

1. Hoover, C. F., Cleveland; J. A. M. A., Vol. 74, p. 226, Jan. 24, 1920.
2. Syphilitic Aortitis, editorial, J. A. M. A. 73:1615 (Nov. 22, 1919).
3. Elliott, A. R.; Syphilitic Aortitis, M. Clinics of North America 1:1305 (1918).
4. Schneider, J. P.; Syphilis of Internal Organs, Journal-Lancet, Minneapolis (1919).
5. Babcock; The Heart and the Arterial System, Appleton & Co. (1903).
6. Leube; Special Medical Diagnosis (Salinger), Appleton (1904).
7. Greene, C. L.; Medical Diagnosis, P. Blakiston's Son & Co. (1917).
8. Osler; Wm. Modern Medicine, Lee Bros. & Co. (1907).
9. Allbutt, Clifford; Diseases of the Arteries Including Angina Pectoris, 2 vols., Macmillan Co. (1915).
10. Bruber; Dohle-Hellersche, Aortitis (1914).
11. Martin, C. L.; Roentgen-ray Study of the Great Vessels, Jour. Med. Assn., Vol. 74, No. 11, p. 723.
12. Hirschboeck, F. J.; Hypertension in its Clinical Aspects, Minn. Med. (1920).
13. Giffin, H. Z., The Am. Jour. Med. Sciences (1914).



CHRONIC INTERSTITIAL NEPHRITIS IN CHILDREN*

By ROOD TAYLOR, M. D.

Ph. D. in Pediatrics, Asst. Prof. Pediatrics,
University of Minnesota.
Minneapolis, Minn.

A chronic interstitial nephritis whose most marked symptoms are excessive thirst, polyuria and retarded physical development, occasionally presents itself in childhood.

The literature of the past fifteen years contains reports of sixty cases, nearly all of which were described in England. Its reported incidence in other countries has been small. Out of seventy-three cases of chronic nephritis in children seen by Heubner only one was of the interstitial type and in this country. Hill, of Boston, who in recent years has studied the subject of juvenile nephritis more extensively than any other American, reports only one case of the severe chronic interstitial form. That the condition is rare in England is evidenced by the fact that of five hundred and seventy-five cases of the disease collected by Sawyer, none occurred under the age of ten years and only four under twenty.

Furthermore, Sawyer found only one instance of the disease in a patient so young as eighteen years in the records of Guys Hospital from 1872 to 1882.

Parkes Weber states that as a cause of juvenile polyuria, it is less frequent than diabetes insipidus. One may question Parkes Weber's dictum; but nevertheless accept the inference as to the rarity of the disease in childhood.

It may be that in the past this disease would have been diagnosed more frequently in childhood were it not for certain confusions.

One is pollakiuria. The practicing physician is so accustomed to the tale of frequent urination amongst children that he is tempted to overlook polyuria. Another obstacle to correct recognition lay in the lack of modern methods for determining renal function and in the absence of knowledge as to the effect of pituitary preparations upon the polyuria of diabetes insipidus. It is the writer's belief that many patients formerly reported as having diabetes

*Read before the Southern Minnesota Medical Association, Fairmont, Minn., June, 1920.

insipidus, were in reality suffering from the juvenile form of chronic interstitial nephritis.

The two cases whose study forms the basis of this paper illustrate the familiar tendency, the symptomatology, the difficulty of recognition, the methods employed in the diagnosis and the poor prognosis of this disease.

The first patient, Jean S., 9 years of age, had been troubled with excessive thirst and polyuria for five or six years. There was no definite time of onset and her parents were not certain but that her great thirst had begun even earlier. The parents and one other child are well, but an older brother of the patient died of nephritis when eleven years old. There was no evidence of syphilis and the Wassermann reaction was negative.

When first seen, the patient was drinking large amounts of milk and was having morning bouts of vomiting. Physical examination disclosed nothing of importance save for a dry skin, moderate malnutrition and retarded physical development. Her urine output averaged four liters daily, ranging from two to six. Its specific gravity varied from 1.002 to 1.009. Casts or red blood cells were never found; but there was frequently a marked trace of albumen. Her eye grounds were normal and her blood pressure ninety-six systolic and sixty-eight diastolic. It is obvious that it was necessary to exclude diabetes insipidus.

Her blood urea at the first examination was 105 mg. per 100 c. c. When her excessive milk intake was reduced, this fell to below 30 mg. and her vomiting ceased. Her blood urea remained low and ten months later was under 20 mg.

Dr. L. G. Rowntree saw this patient and many of the tests were carried out under his direction. Her average two-hour phthalein output was 12 per cent as contrasted with a normal at her age of 60 to 70 per cent. On a Mosenthal test diet, the specific gravity of her urine showed a definite fixation of from 1.007 to 1.009. It is evident that her kidney function was definitely impaired despite the apparent absence of urinary abnormalities on first examination.

In addition to chronic interstitial nephritis renal impairment resulting from congenital polycystic kidneys might conceivably produce the same picture. Such kidneys are nearly al-

ways enlarged. In this patient there was no palpable kidney tumor and no radiographic evidence of renal abnormality.

Renal function in diabetes insipidus has been studied by Fitz and by Cowie. Both found a normal excretion of phenolsulphonephthalein and Fitz a normal non-protein blood nitrogen.

Significant renal pathology has not been found post mortem in known cases of diabetes insipidus. The literature, however, contains a report by Heubner of an autopsy which showed contracted granular kidneys and a tumor of the hypophysis.

It has been definitely shown that the administration of preparations of pituitary gland will diminish the polyuria of diabetes insipidus. The feeding of raw gland substance and the injection of its commercial preparations had no result in this case.

The second patient, Robert P., was brought in because of failure to gain in weight. He had marked rickets with genu valgum. He was obstinately constipated and his rectum was filled with impacted feces. The father and mother were well. They had had one previous child who had developed a polyuria at the age of six months and had died at the age of three years of "Brights Disease."

The patient was said to have been healthy until he was weaned at fourteen months. He then had tonsillitis with fever for two and one-half weeks and his parents believe that his trouble dates from that illness. It was difficult to obtain all the patient's urine, but his fluid intake averaged two liters a day, or about one fourth his body weight. He was always thirsty and required water many times during the night. On one day 1225 c.c. of urine was collected. The specific gravity was nearly always from 1.008 to 1.010. A trace of albumen and a few casts were present in nearly every specimen. His two-hour phenolsulphonephthalein excretion was 11 per cent on one occasion and 15 per cent on another. His blood urea on a low protein diet was 16.6 mg. Creatinin determinations were not made. No kidney tumor could be palpated. His blood Wassermann was negative and he showed no signs of syphilis.

The evidence in this case pointed so clearly to nephritis as the cause of the patient's trouble

that no study was made of the effect of pituitary extract.

As regards the etiology of this disease in early life, little is known. Several of the reported cases were very evidently due to lues. That it follows an acute diffuse or parenchymatous nephritis is argued against by the fact that only a small percentage of the reported cases have been known to have had a preceding acute nephritis with edema. In fact the history of edema is noticeably lacking. However, it is possible that such a condition could have developed during intra-uterine life. In fact, Karsner reports a well developed baby who died forty-five minutes after birth and on whom at autopsy there was found an acute parenchymatous nephritis. Acute parenchymatous nephritis has been observed by several reporters during the first weeks of extra-uterine life.

Sawyer points out the difference between the sex incidence of parenchymatous nephritis which he states occurs more frequently in males than in females and the ratio in the interstitial form which in his series of forty-six collected, was as two males to three females and believes that this discrepancy argues towards some other cause than a preceding parenchymatous nephritis.

The familial character of this type of nephritis has been previously pointed out by Dickinson and Barber.

Autopsies reported by Miller and Parsons, by Naish and others, uniformly showed small shrunken granular kidneys, usually weighing less than an ounce and with fibrous overgrowth and lymphocytic infiltration of the interstitial tissue.

Neither patient showed increased blood pressure or cardiac enlargement. This is in accord with the majority of reported cases.

Both of the writer's cases were obstinately constipated, apparently the result of the organism's great demand for water with consequent inspissation of the contents of the bowel. This symptom was successfully treated with liquid paraffin. Otherwise treatment was directed towards building up and protecting the child, the diet containing protein largely in the form of milk, the quantity of which was limited.

The first patient reported spent the winter in Florida, but died shortly after her return,

probably from uremia. Her home was in another state and no autopsy was made.

These two cases and those gleaned from the literature combine to give a composite picture of juvenile chronic interstitial nephritis as follows: A female child rather poorly developed and somewhat under nourished, her skin is dry, rather brown, and somewhat inelastic. Her most troublesome symptom is thirst. Further study reveals first, polyuria, and second impaired renal function. She is always on the brink of uremia and lives at the most only a few years past childhood.

The writer wishes to emphasize the following conclusions: First, that in any chronic disease of infancy or childhood accompanied by wasting or retarded physical development it is necessary to study the function of the kidneys more extensively than is done by ordinary examination of a single specimen of urine. Second, that since in chronic interstitial nephritis, as it occurs in childhood, large quantities of urine may be passed containing none or little albumen and no casts or erythrocytes, other tests of kidney function must be made before the kidneys are pronounced sound and some other diagnosis, as for example that of diabetes insipidus is made.

REFERENCES

- Dickinson-Keating's *Cyclopedia of Diseases of Children*, Vol. III, 556.
- 1906—Sawyer—The Etiology of the Granular Kidney of Childhood. *St. Thomas Hosp. Rep.* 35, 459-476.
- 1903—Sutherland and Walker—Two cases of Interstitial Nephritis in Congenital Syphilis. *Brit. Med. Jour.*, 1903, 1, 959-962.
- 1912—Miller and Parsons—Renal Infantilism. *Brit. Jour. Children's Diseases*, 9, 289-304.
- 1912—Naish—Infantilism with Chronic Interstitial Nephritis. *Brit. Jour. Children's Diseases*, 9, 337-343.
- 1913—Heubner—über Chronische Nephrose im Kindesalter. *Jahrb. F. Kinderh.* 77, 1-20.
- 1913—Barber—Chronic Interstitial Nephritis in Children. *Brit. Med. Jour.*, 1913, 2, 1204.
- 1908—Kosmak—Nephritis in the New-Born. *Bull. Lying-in Hosp.*, N. Y., 5, 190-194.
- 1919—Hill—Studies in the Nephritis of Children. *Amer. Jour. Diseases of Children*, 17, 270-294.
- 1908—Karsner—Congenital Nephritis. *N. Y. Med. Jour.*, 1076-1079.
- 1912—Kendall and Hertz—Hereditary Familial Congenital Hemorrhagic Nephritis *Guy's Hosp. Reports*, 66, 137-141.

- 1901—Atlee—Quoted by Kendall and Hertz—St. Bartholomew's Hospital Jour., 9, 41.
 1912—F. Parkes Weber—Diabetes Insipidus in a Boy Brit. Jour. Children's Diseases, 9, 211-214.
 1914—Flitz—A case of Diabetes Insipidus. Arch. Int. Med, 14, 706-721.
 1919—Cowie—Diabetes Insipidus in a Girl of Ten Years. Amer. Jour. Diseases of Children, 18, 194-198.

DISCUSSION

DR. L. G. ROWNTREE, Rochester: I think that the paper of Dr. Taylor is very timely. I have seen two cases of this disease in addition to those reported by Dr. Taylor, and possibly one other, making a total of five. In all but one instance the initial diagnosis, before studies were made, was incorrect. I think that I can probably emphasize the difficulties of diagnosis by relating a story.

In the early days of our work with phthalein we found in the ward a child about 10 years of age diagnosed diabetes insipidus. On going into the history of the case we found this patient had visited the dispensary at Johns Hopkins, and on account of the polyuria and the low specific gravity of the urine, was considered a case of diabetes insipidus. After entrance to the hospital the patient was used as the subject of many discussions on diabetes insipidus. Dr. Geraghty and I were interested and made tests of the renal function, and were tremendously surprised to find 7 per cent phthalein output. We made a diagnosis of chronic interstitial nephritis, despite the absence of eye ground changes, vascular and cardiac changes, and of albumin in the urine, although the dispensary history indicated that a trace had been found on one occasion. On a second test we found the output only 3 per cent, so we adhered to our original diagnosis. About three days later albumen appeared in the urine in small amounts. The next day the child developed headache, on the third day convulsions, and on the fourth day, died. The autopsy revealed an advanced chronic interstitial nephritis.

Here, then, was a clean-cut case of chronic interstitial nephritis proven by autopsy, and diagnosed diabetes insipidus. The true condition was not recognized in the wards of one of our leading hospitals. It brings home the question of the diagnosis of chronic interstitial nephritis in childhood. Apparently in early childhood there was little or no change in the vascular system, such as is usual in the disease in older life. This may be because the tissues are young and vigorous, and the disease short lived, time not permitting of the vascular changes so common in this disease.

Albumen may appear intermittently. This does not help very much in the differential diagnosis, because in 16 out of 26 cases of diabetes insipidus reported at the Mayo Clinic, albuminuria was intermittently present; consequently, the presence or absence of small quantities of albumen would not help very much in the diagnosis.

The second case I saw in Vienna in the wards of Von Pirquet. There were two cases side by side putting out three to six litres of urine a day. Dr. Von Pirquet said that one patient had diabetes insipidus with a pituitary lesion, and the other had chronic interstitial nephritis. Renal functional studies were made at our suggestion and the diagnosis of diabetes insipidus showed a high phthalein output, while, in the case of chronic interstitial nephritis, it was greatly reduced. The diagnosis was really quite easy, since the child showed definite evidences of Frohlich's syndrome.

In addition to these cases, I have seen one other. This was also diagnosed diabetes insipidus. It was in a child, first seen at seven years of age, and again at nine. In this child the phthalein output was 20 per cent. Small amounts of albumen were constantly present. Because of complete failure to respond to pituitary extract, I firmly believe this is also a case of chronic interstitial nephritis. In many instances the diagnosis is one of exclusion. I do not believe that we can make a diagnosis of chronic interstitial nephritis in childhood until we have excluded diabetes insipidus. In some cases of polyuria with marked involvement of renal function, with the absence of reaction to pituitary extract, we can make a diagnosis of chronic interstitial nephritis, even in the absence of an albuminuria.

Dr. R. N. ANDREWS, Mankato: In going over the literature on the subject of chronic interstitial nephritis in children I am convinced with the author of the principal paper that this disease occurs much more frequently than we think. The reason that it is overlooked is because of the lack of careful diagnosis and perseverance in individual cases. I realize that the findings are often rather obscure, and yet when all the facts are taken into consideration the diagnosis can usually be made. We have many children come to us who are undersized, weak, generally run down, anemic, who are examined in a general way, with one examination of the urine and are treated as a case of anemia, when, if everything was considered in the way it should be, these very cases may have at the root of all their trouble, a chronic nephritis.

We must not lose sight of the fact that some of these children who have a chronic nephritis with the accompanying symptoms of general weakness, etc., may have back of all this a syphilitic taint. If all of these cases came to autopsy this would be absolutely verified, but as they do not, we can only suggest this in passing as being something worthy of a further consideration.

Much has been said concerning the classification of nephritis. It is claimed that a pure chronic interstitial nephritis is almost a nonentity. We may have a case showing all the symptoms of nephritis, such as polyuria, asthenia, visual disturbances, no edema, with low specific gravity of the urine, small amount of albumen, occasional casts and we are inclined to say this is a case of chronic interstitial nephritis; but when the case finally comes to autopsy there is

a pathology not only in the structural tissue, but also in the parenchymatous tissue. In other words, the two types of nephritis overlaps so that it is impossible to say that either one or the other exists in itself. Consequently they have adopted at Harvard this classification of a chronic nephritis:

Chronic nephritis

- a. with edema
- b. without edema
- c. with hypertension
- d. without hypertension

In going over the record of the Children's Hospital in Boston for the past fifteen years (this is a hospital of 60 beds), we find the diagnosis of pure chronic interstitial nephritis was made only once. The cases were examined there more carefully than they would be in an ordinary run of a private practice. The diagnosis is made in a good many of these cases as one of chronic nephritis, there being no distinction between the types. In the same period of time the diagnosis of diabetes insipidus was made five times, so in this institution at least, diabetes insipidus is more common than chronic interstitial nephritis.

There is a type of chronic interstitial nephritis, rather rare, which is found more frequently in England than elsewhere, associated with infantilism. In this type of case we have the polyuria, low specific gravity, 1003-1006, slight trace of albumen and a very few casts. Patient subject to headache, vision is poor and there may be an albuminuric retinitis. Blood pressure usually normal. Vascular changes may be nil, or there may be some cardiac hypertrophy and a high blood pressure. Functional tests are low and prognosis is bad. Etiology of these cases is unknown. A 12 to 13 year old child may be only four feet high and much under-developed. There are two types of cases; one with a chronic interstitial nephritis and the other type without a true nephritis; that is, without any renal disease but with a diabetes insipidus.

Dr. Lewis Hill, Boston, cites a case of a child seven years old, who, since a year old had been subject to bilious attacks. Child has always been thin. These attacks would come on once a month, then once a week, then two times a week, and would last from 12 to 24 hours. They would begin a 3 or 4 in the morning with headache and vomiting and would not bear relation to over-fatigue or over-eating. Child drinks a lot of water and passes a great deal. Urine negative, with an occasional trace of albumen, no casts, no blood. For the past two months headache has been almost constant, there is poor vision, and a week ago there was blood in the urine. Now we have an albuminuric retinitis, with no edema; specific gravity of urine 1010-1014, contains some granular and some hyalin casts. Phenolsulphonethalein 55 per cent.

These cases illustrate how hard it is to make a diagnosis of nephritis early, but how easy it is when you have all the symptoms which are recorded here. It is these early cases that we should be on the lookout for and if possible diagnose. Most of these

children do not seem very sick and nephritis would never have been diagnosed except for repeated examination of the urine with various tests applied.

We must bear in mind, however, that these children are always under-developed both mentally and physically. The blood pressure where the case is at all advanced, or where the disease has existed for some little time is usually high, there is cardiac hypertrophy and visual and gastric disturbances. There is polyuria and pollakiuria. This is the only form of nephritis in infancy in which the blood pressure is high with a cardiac hypertrophy. Whenever a persistent high arterial tension occurs with albuminuria and other signs of disturbed renal function, a case of contracted kidneys exists.

There are a few tests that are of practical value in making a diagnosis of nephritis, not only from the diagnostic, but also from the prognostic standpoint. First, is the functional test with phenolsulphonethalein. It must be remembered that children run a little high, the normal average being 70 per cent. This test is reliable and should be used. Again, we have a two hour renal test of Mosenthal. This is ordinarily easy to carry out and is of considerable value in checking up a case. A repeated low phenal test means the kidneys are severely damaged and the prognosis bad. Finally the examination of blood for creatinin and urea-nitrogen. This is more difficult because of the chemistry involved. A high blood urea is of a bad prognostic sign.

I do not care to go into the treatment of this disease because time will not permit. Again, there is considerable difference of opinion as to the methods to be used; suffice it to say in these cases a marked restriction of diet is not necessary; but hygiene and general living conditions are more important.

DR. ROOD TAYLOR, Minneapolis (closing the discussion): I presented this subject to bring out a good discussion, and that I think I have succeeded in doing. I feel that we have been very fortunate in having Dr. Rowntree come out here and stay here and teach us and stimulate us to know more about the subject of nephritis.

Dr. Andrews mentioned the diagnosis of infantilism. I purposely avoided it, although a number of cases are reported in the literature as renal infantilism, as chronic nephritis with infantilism, and so forth, because I think any chronic disease in early childhood, whether it be chronic nephritis, hepatitis, hematogenous jaundice, chronic intestinal indigestion, no matter what the disease is, it will produce a type of retarded physical development which is entirely secondary.



ACUTE DILATATION OF THE STOMACH*

By O. W. HOLCOMB, M. D.
St. Paul, Minn.

The term itself implies merely a symptom, but in common usage refers to a distinct entity of uncertain etiology, characterized clinically by a sudden onset, rapid distention of the abdomen, usually vomiting of quantities of dark watery fluid, and symptoms of collapse.

Brinton (1858) and Rokitsanski (1863) were among the earliest writers to call attention to the condition. Later Fagge (1883) more accurately described it. Since this time a number of papers have appeared on the subject, and a relatively large number of cases reported.

The following points with reference to the anatomy and movements of the stomach are of interest. The stomach hangs suspended from the esophagus by its cardiac extremity. The pyloric extremity is more or less mobile. When empty it hangs almost vertically in the back part of the abdomen; when distended it rotates on its transverse axis so that the anterior surface is turned upward and the posterior surface downward. In this way the stomach is brought well against the anterior abdominal wall. The orifices are guarded by sphincter muscles normally in a state of tonic contraction. The opening of the cardiac sphincter occurs either as a result of pressure of food or drink from above or as a part of the reflex act of swallowing. The pyloric sphincter is opened by the presence of fluids or foods in a semi-solid condition, being especially favored by the presence of free hydrochloric acid. The stomach is regarded as an automatic organ, similar to the heart,—stimuli to movement arising within itself. In addition, it is supplied by regulatory fibres,—motor from the vagi and inhibitory from the splanchnics. The duodenum is the most fixed part of the small intestine; it begins on the right side of the body of the first lumbar vertebra, and ends at the left side of the second vertebra. In front of the third portion are the superior mesenteric vessels and the root of the mesentery (Davis).

Owing to our limited knowledge regarding

the pathogenesis of acute dilatation, many theories have been advanced as to its probable cause. In the main, two groups of cases occur: (1) Post operative; (2) Those arising spontaneously in which no operative interference has taken place.

In 1918 Doolin of Dublin collected 188 cases. In this series 69 per cent occurred after operations, while 31 per cent occurred in non-operative conditions. Of the operative cases 96 per cent occurred after operations on the abdominal viscera; 4 per cent after extra-abdominal operations. In the non-operative cases several factors may be responsible for the precipitation of an attack, such as overeating or injuries to the abdominal wall. The condition may occur during the course of acute or chronic illnesses; in rare instances after child-birth. Still others have been observed in cases of spinal deformity, and finally, a number of cases occur without any apparent cause.

For purposes of discussion, the theories regarding the etiologic factors may be divided into functional and organic or mechanical.

1. Functional.

Paralysis of the stomach. This is probably the most accepted explanation. It was first suggested by Brinton¹ and later supported by such writers as Steida, Von Herb, and particularly by Braun and Seidel². In support of this it may be said that many cases occur in which no organic or mechanical factor can be traced either during life or at post mortem.

As to the cause of paralysis, Braun and Seidel conclude that it is due to alterations of gastric innervation—central, peripheral and reflex; that all surgical forms, as well as those occurring in association with infectious diseases, and with constitutional and other ailments, may be explained on this basis—that injury to the muscle fibers through mechanical, inflammatory or toxic lesions is possible, though no gross histological changes have thus far been observed.

Experimentally, the condition has been produced in dogs by section of the vagi³, also in dogs under same conditions, which have had a gastro-enterostomy⁴.

Under this division, too, must be classified

*Read before the Ramsey County Medical Society, St. Paul, April 26, 1920.

¹Brinton (1858) Lectures on diseases of the stomach.

²Braun & Seidel Progressive Medicine, No. XL p. 47.

³Carion & Hallan (1895).

⁴Steida (1900).

those cases which have been observed to occur during anesthesia in the course of an operation. In several such cases the swallowing of air has been noted, and the cause of the dilatation attributed to this. Except as a factor operating upon an already prepared basis, this must be a negligible element, since none of the habitual aerophagics appear to be susceptible.

2. Organic or mechanical.

(a) Compression of the horizontal portion of the duodenum by the root of the mesentery and mesenteric vessels (Rokitanski). This is illustrated in cases of the removal of a pelvic tumor; the intestines sink down into the empty space and so put a drag upon the root of the mesentery with its vessels so as to cause a compression of the duodenum at its crossing. As opposed to this theory, is the rarity with which the condition is met after child-birth. And only in a small percentage of cases is there a noticeable degree of compression post mortem. (Doolin).

(b) Torsion or volvulus of the stomach.

When such an accident, though rare, occurs, ideal conditions are brought about to produce a dilatation, by the complete mechanical closure of both the cardiac and pyloric orifices of the stomach. But that this has no part in the average case of acute dilatation is demonstrated by the ease with which a stomach tube may be passed in all such cases.

It is evident that the malady may occur under the most varied conditions, but what the real factors are in its production are still sub-judice. Certainly no one theory thus far advanced explains more than a limited number of cases. Apparently then, while the effect may be the same, the development of a case may be the result of either a functional or mechanical derangement.

SYMPTOMS AND DIAGNOSIS

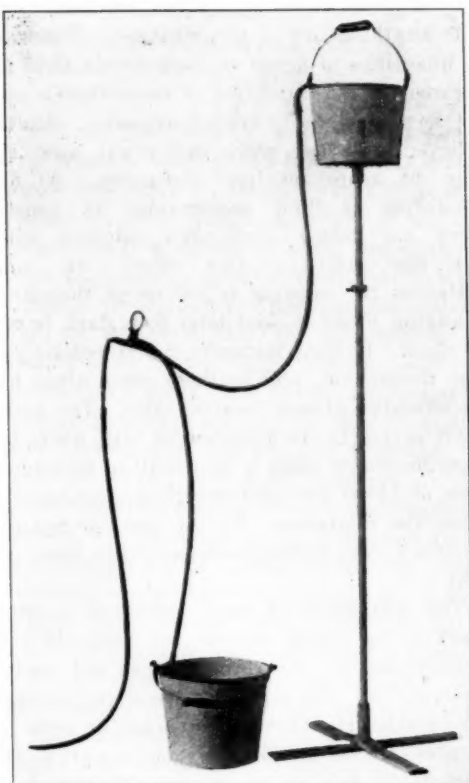
The condition may occur at any age, but the ages between 20 and 40 are most common. It occurs oftener in females than in males. Statistics vary, but approximately three-fourths of all cases occur after operations. In well defined cases the onset is sudden. In the post operative group, the beginning may be on the operating table or while the patient is still under the influence of the anesthetic. More frequently, however, there is a lapse of one to

several days before symptoms occur to indicate anything out of the ordinary. Vomiting of quantities of green or dark brown fluid associated with a distention of the abdomen may be the first signs to attract attention. Unless relieved by lavage, when once begun, vomiting may be more or less continuous. A few mouthfuls of fluid accompanied by eructations are raised every few minutes without any particular effort. In most instances the vomitus is yellow at the onset, changing to green, and later to a dark brown or black. In some instances it may remain yellow throughout, and in these cases often has an offensive, almost feculent odor. The green color is due to the presence of bile, while the dark brown or black is the result of an admixture of blood due to hemorrhages consequent upon the dilatation. In the cases personally observed free hydrochloric acid has been absent.

The distension in most instances is very marked, in others extreme, so much that it greatly impedes the respiration as well as the heart action. The lower border of the stomach may reach well below the navel and in some instances into the pelvis. It is due in part to the presence of fluid, in part to gas. The source of both is still in dispute. Some hold that the gas is nothing more than swallowed air, while others believe it is the result of fermentation, probably both are important factors.

Equally interesting is the question of the source of the fluid. The rapidity of the recurrence of large quantities after removal, at times seems almost unbelievable. While the offensive character at times would indicate an intestinal regurgitation due to retro-peristalsis, yet the most plausible explanation would appear to be gastro-circulatory stasis.

Other symptoms of secondary nature follow in rapid sequence, such as respiratory and circulatory distress. The respiration is quick and shallow, the pulse rapid and feeble. The temperature falls. Often there is restlessness and an anxious expression. In some instances there is cyanosis and lividity; in others the complexion changes to a yellow waxy color. The tongue is dry and beefy, and thirst unquenchable. The urine is scanty and occasionally suppressed. Post mortem the stomach is described as being



Lundholm siphon apparatus for gastric lavage.

enormously dilated and occupying the greater portion of the peritoneal cavity. The gastric walls are thinned and the seat of numerous hemorrhages and erosions. In many cases the duodenum, up to the mesenteric crossing, participates in the dilatation. Keen⁵ records a case where the first portion of the jejunum was also involved.

PROGNOSIS AND TREATMENT

The number of recoveries vary in direct proportion to the recognition and treatment of each case. The high mortality quoted by the early writers and the relatively large number of recoveries recorded in the more recent papers are sufficient evidence of this.

The prompt use of the stomach tube is the treatment par excellence and will save the majority of cases. All food, as well as water by the mouth, should be withheld and proctoclysis with rectal feeding instituted. Where the rec-

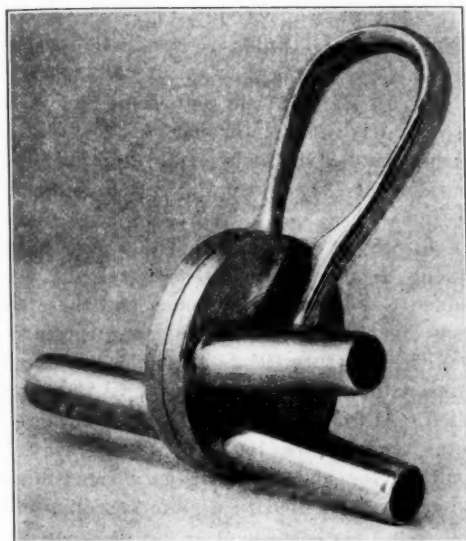
tal salines are not taken well, hypodermoclysis should be given. As a rule the period is brief and every effort should be made to maintain whatever balance of vitality the patient may still possess. The manner and frequency of giving the lavage is important. A tube of rather large caliber is best suited for the purpose. Owing to the toxicity of the gastric contents it is essential that the lavage be thorough. At Bethesda Hospital we have been using an apparatus originated by the late Dr. Lundholm for this purpose. This device consists essentially of a three-way stop cock connected with tubes in such a manner that the water is first syphoned into the stomach from a pail held a couple of feet above the level of the patient, and then by a change of the connection, syphoned out of the stomach through a tube leading to a pail on the floor. Luke warm water is used and the washing is continued until the return is clear. By the use of this simple device the stomach is quickly and thoroughly washed. Just as soon as there is a tendency for the distention to recur, the stomach should be emptied and thoroughly flushed, whether it be in one, two or three hours. Ordinarily a lavage every three or four hours will accomplish the purpose and make the patient comfortable. In many instances the patients experience such a relief, that after the first or second washing they themselves give notice when a lavage is required. The washings are continued at specified intervals until the gastric contents return clear from the start of the lavage. At this stage feeding by mouth may be begun; water first, then liquids cautiously increased.

The other important form of treatment is the prone position first described by Schnitzler. Of 26 cases reviewed by Borchgrevink⁶, 22 recovered by this treatment. The patient is turned with the abdomen down, a pillow or two being placed under the hips for support. Considering the gratifying results reported by this simple method, a fair trial at least should not be neglected.

Except as circulatory stimulants and to meet symptomatic conditions, drugs have little or no value in the treatment of these cases. Bassler recommends a single dose of Elaterin in the form of the Titration of Elaterin, Gm. 0.032, by

⁵Keen's Surgery.

⁶S. G. & Ob., 1913.



Two-way cock, Lundholm siphon apparatus.

mouth as a purgative. Also enemas of powdered alum, Gm. 30.0 to 500 c.c. of warm water. Unless there are definite signs of organic obstruction which can not be relieved by lavage or posture, surgical interference is not indicated. Besides the improbability of relieving the situation, none of these cases are in a condition to either take an anesthetic or be operated.

SUMMARY

1. Acute dilatation of the stomach, while not common is by no means rare.

2. Though the symptoms are much alike, the pathogenesis is not the same in all cases. The geneses of the functional and organic types are essentially different.

3. As pointed out by Robson (Keen's Surgery), volvulus or torsion of the stomach is a condition in itself and should be treated as such.

4. Many cases follow operations for appendicitis and other abdominal conditions which are not diagnosed, but improperly attributed to shock, ileus, intestinal obstruction, and the like.

5. Mild cases may, and undoubtedly do recover at times spontaneously. In most instances, however, untreated cases rapidly prove fatal.

6. Early and repeated gastric lavage will save the majority of cases. In well developed

cases at least one trial lavage should be given where the first return of the gastric content is clear before the washing is discontinued.

7. The posture treatment should not be forgotten. Cases may be saved by this procedure where other measures fail.

8. Surgery is not indicated except where there are definite signs of obstruction, in which cases naturally lavage and posture fail. An offensive or feculent odor of the vomitus or gastric content is not in itself prime evidence of an obstruction.

CASE REPORTS

CASE 1. Acute dilatation of stomach following ingestion of foreign matter. C. O., age 5, Aug. 19, 1910.

This case occurred under the most extraordinary circumstances. At about 7 p. m., the boy, who before that time had been playing in front of the house, suddenly disappeared. His mother, together with a visiting neighbor, went to search for him. They found him head first in a latrine in the rear of the house. Whether he had gone there to vomit or under what circumstances he had met with this accident, I was unable to learn. He was taken out and brought into the house in an unconscious condition. At the time of my arrival he was deeply cyanosed, respiration shallow and irregular, pulse barely perceptible. His abdomen was distended to an extreme degree. Few ounces of frothy, offensive fluid driled from the mouth. It was apparent that he had swallowed quantities of foreign toxic matter. I passed a stomach tube and immediately relieved him of large volumes of gas, and in the washings, quantities of most nauseating putrid fecal material. By the time I was through with the lavage, his consciousness began to return, his general condition markedly improved, and the size of the abdomen was down to practically normal. Except for a slight rise in temperature the following day and a moderate diarrhea, which persisted for a few days, recovery was rapid and uneventful.

Comment: This case is illustrative of the type occurring after the ingestion of large quantities of food or foreign material. In this instance possibly there was a swallowing of air together with quantities of toxic matter.

CASE 2. Acute dilatation of stomach with-

out apparent cause. Mr. C., male, age 48.

Suddenly after retiring about 11 p. m. began to complain of extreme distress in the upper abdomen. On my arrival I found the patient leaning back in a Morris chair. He complained of great distress and said he could neither sit up nor lie down; his abdomen was greatly distended and tympanitic, especially to the left of the median line. Respiration was impeded and pulse small and irregular. Though not particularly nauseated, he suggested that if he could only vomit he thought he would be relieved. I suggested a stomach wash of which he approved. Immediately he was relieved of quantities of gas and a thin serous, greenish, odorless fluid. Recovery was prompt. He passed a good night, and except for a slight soreness of the upper abdomen, the patient was well the following day.

Comment: In this case no known factor responsible for precipitation of the attack could be traced. In a recent conversation with him, he informed me that he has had two similar attacks, but much milder. In each instance he was able to relieve himself by inducing vomiting.

CASE 3. Acute dilatation of stomach following cholecystotomy for cholelithiasis. Mrs. S., age 54, Feb. 4, 1911.

This patient was a woman of small stature, rather lean, but otherwise in fairly good physical condition. For the past 7 or 8 years she had suffered from repeated attacks of pain in the upper abdomen, of varying intensity and duration. She had never been jaundiced. Except for a moderate tenderness in the region of the gall bladder, physical examination was rather negative.

Operation (Ether anesthesia). Right rectus incision. The gall bladder was imbedded in an extensive mass of adhesions rather difficult to separate. After having accomplished this, the gall bladder was opened and a number of pea sized stones removed. No stones were palpable in either of the ducts. The pyloric end of the stomach was rather fixed, on account of extensive adhesions in this region. Appendix about normal and not removed. Tube drain inserted, wound sutured, and patient returned to her room in good condition.

Proctoclysis was administered from the start.

Afternoon passed without anything of note. Evening, T. 98.3, pulse 84, respiration not recorded.

Feb. 5. Patient had not slept much but rested fairly well. Morning, T. 98, pulse 84. During the day she took some water and liquid nourishment. Evening, T. 98 $\frac{3}{5}$, pulse 80. Resting well.

Feb. 6th, at 2:30 a. m. The record shows patient became extremely restless; she complained of pain in the abdomen and there was great distention. Pulse 120, respiration 50, rectal temperature 101.2. A Nobles enema was given with good results and some flatus expelled. At 5:30 a. m. pulse 120, respiration 46, rectal temperature 100 $\frac{1}{5}$. There was no vomiting, the abdominal distention continued, and the patient died in a state of collapse at 9:30 a. m.

Comment: Unfortunately, a diagnosis was not made in this case until the patient was moribund. No post mortem examination could be obtained. This case is illustrative of a well defined post operative type, which, when untreated, rapidly prove fatal.

CASE 4. Acute dilatation of stomach following cholecystotomy for cholelithiasis and suspension of uterus. Mrs. B., age 38. June 11, 1913.

Patient of average size and build. She had complained of dyspeptic symptoms about 6 years. At no time had there been a clear cut attack of gall stone colic. Symptoms of hyperacidity and a vague distress in the upper abdomen were the chief complaints. Examination: Color and nutrition good, chest negative; moderate tenderness in right epigastric region and at McBurney's point. Pelvic examination showed a marked retroversion of the uterus; excessive hypertrophy of the cervix, and extensive laceration of the perineum.

A two-stages operation was decided upon: First, laparotomy, for cholelithiasis with shortening of the round ligaments. Second, perineal for the purpose of amputation of the cervix and repair of the perineum.

First Operation (Ether anesthesia). Right rectus incision. Gall bladder opened and three large stones removed; tube inserted for drain and incision closed. A median incision was made from the umbilicus to the pubic bone. A

chronic appendix removed and a Baldy-Webster operation for shortening of round ligaments done. The abdomen was closed. The patient was returned to her room in good condition.

There was nothing unusual to note during the first two days. Pulse and temperature normal. There was no post operative vomiting. On the second day, she had in addition to water, 2 ounces of buttermilk, and later 4 ounces of chicken broth.

Suddenly at noon on the third day, she began to vomit. First at 1:20 p. m. a moderate amount of brownish fluid, then at 3:20 and at 4:15 p. m. a large amount, and after that frequent raising of small quantities, until at 5:30 when I saw her she was very restless and distressed from a marked distention of the abdomen. The nurse was required to hold a basin in front of her mouth almost continuously, as every few moments, almost without warning, she would raise a few mouthfuls of thin dark brown fluid. Her temperature at this time was 97.4, pulse 84, respiration 24. Her pulse was feeble but not excessively rapid for this type of case. I decided at once to begin the use of the stomach tube. Immediate temporary relief was obtained. I was not aware of the benefits to be derived from systematic lavages at frequent intervals at this time, hence the washings were given only as seemed to be indicated after the first treatment. After 5 or 6 lavages, continued over a period of 48 hours, this patient made an uneventful recovery.

Comment: This was another rather typical post operative case, arising without any apparent cause. On Nov. 8, 1913, her perineal operation was done; cervix amputated, cystocele obliterated and perineum repaired. Following this operation, there were no post operative complications.

CASE 5. Acute dilatation of stomach following operation for acute perforative appendicitis with general peritonitis. Miss R. C., age 18. Sept. 12, 1915.

When I saw this patient she gave a history of having been ill with a pain in the right side of the abdomen during the past 6 days, rather bad for 3 days, but only severe for one day. Temperature 102, pulse 100. On examination, there was general abdominal rigidity,

most marked over McBurney's point. A diagnosis of general peritonitis was made and an operation was advised.

Operation. A right rectus incision was made; a general peritonitis was found. The appendix was gangrenous at the distal end; at the middle there was a perforation at the site of a fecal concretion. The appendix was removed. A large tube was placed so as to drain the posterior cul-de-sac, and another to drain the lumbar fossa. The wound was sutured and patient returned to her room.

The patient was placed in Fowler's position and proctoclysis ordered. She had emesis three times during the first night; first, of a light green color, then changing to a dark green. Morning of first day. Temperature 98.4, pulse 114, respiration 30. Nothing out of the ordinary took place during the day. Evening temperature, rectal 101 F, mouth 97.6, pulse 102, respiration 28.

Morning of second day. Temperature 98.4, pulse 102, respiration 22. Had had one large stool and several small ones. Had taken some hot water and small amounts of orange juice; about midnight had vomited 3 ounces of green fluid; slept at short intervals. During the day she had another large stool, and again vomited about 4 ounces of green fluid. Evening temperature 97.6, pulse 96, respiration 22.

Except that the patient had a moderate diarrhoea, i. e. passing 4 or 5 stools per day, nothing out of the ordinary took place the following two days. Temperature about normal and pulse ranging about 100.

On the fifth day, her abdomen became distended and she complained of being distressed but did not vomit. A lavage was ordered. The returns showed some undigested particles of food. A temporary relief was obtained, but again during the night she had emesis of 1 ounce, and at 3:30 a. m., 16 ounces of fluid of an offensive odor and brown color. After this, gastric lavage was ordered to be given every 4 hours. Rectal feeding was instituted and proctoclysis continued. The lavages were continued for 48 hours before the first returns of the gastric contents were clear. At nearly every lavage the contents had a decided feculent odor, which was very offensive in character. At no time during this period did her

temperature rise above normal. After the gastric symptoms subsided, however, there was an evening rise of one to two degrees for a few days. The pulse, however, receded and approximated the normal.

After the washings returned clear from two trial lavages, feeding by mouth was begun, and convalescence was uninterrupted.

Comment: To my mind this case represents one of the post operative types of a toxic origin, which though in many instances not recognized, are not infrequent during the course of peritonitis—general or local.

CASE 6. Volvulus or Torsion of Stomach. Mr. M. (Referred by Dr. Thos. Gratzek) Boiler-maker, age 54. Feb. 16, 1916.

While at work drank considerable water; began to feel pain in stomach which rapidly became severe; could not go home unassisted. Was nauseated but could not vomit. Had eaten some oranges at noon; bowels had moved same morning. Was seen by Dr. Gratzek at 11 p. m.; temperature 99, pulse 110. Tenderness, marked rigidity in upper abdomen.

Feb. 7, 7 a. m. Very marked distension in upper abdomen, marked rigidity and tenderness; could not pass stomach tube. Was sent to Bethesda Hospital where I was asked to see him. At this time he was in great pain, nauseated, but could not vomit. On examination found same condition present,—namely, extreme distention in upper abdomen, lower abdomen retracted. Again an attempt to pass stomach tube was unsuccessful. At 2 p. m. he was sent to the operating room and prepared for operation. After he was completely anesthetized, another unsuccessful attempt at passing the stomach tube was made. An incision was made in the upper abdomen, through the rectus, slightly to the left of the median line. Stomach was found to be extremely dilated. A purse string suture was placed, and within the circle a large trocar was inserted. A large amount of gas was emitted, with small amount of dark fluid and particles of food. Trocar was withdrawn and purse string tightened and tied.

An interesting point was that when purse string suture was cut and stomach allowed to drop back, we were unable to again locate point

at where same had been placed, indicating that a great deal of rotation had taken place.

The abdomen was closed. Stomach tube could now be passed without difficulty. The patient made an uneventful recovery, and has been in good health since that time.

Comment: This case represents a type clearly due to mechanical causes, and while the symptoms produced are much the same as in the functional cases, the condition is essentially different and requires operative means for relief.

CASE 7. Acute dilatation of stomach following operation for acute perforative appendicitis with general peritonitis. Mr. F. V., age 45. Merchant. This patient gave a history of having been ill two days. Onset sudden, with colicky pains, some vomiting, but no movement of the bowels except by enema. Temperature 99, pulse 64, respiration 18.

On examination there was a moderate distention of the abdomen; no rigidity to speak of, but some tenderness slightly to the right and just below the umbilicus.

Owing to the uncertainty of correct diagnosis in this case a median incision was made from the navel down. A general peritonitis was present; the appendix was ruptured and partly buried in a tuft of omentum. The distal end was partly gangrenous. The appendix, with the affected portion of omentum was removed. A large drain was placed in the pelvis and the wound sutured.

On the first day the patient had emesis of clear, watery fluid, following the operation. A quart of rectal salines was retained during the afternoon. Evening temperature 99.5, pulse 80, respiration 22. He had a fairly good night and passed the following day as well as the average case.

On the second day there was more distention of the abdomen than there had been before. During the day as enema was given, but no relief was obtained from this. Gastric lavage was ordered. The contents of the stomach returned greenish in color. Evening temperature 98.6, pulse 84, respiration 24.

Third day. A fair night was recorded; pulse and temperature about the same; but abdominal distention and distress continued. Gastric lavage was given and ordered to be continued

every four hours until the first returns would be clear. The character of the contents is described on the chart as a brownish green and a greenish yellow, and yellow with bile. During the day he had a large liquid stool. Evening temperature registered 98.8, pulse 76, respiration 22.

After three washings had been given the returns were practically without color and the lavages were discontinued. The patient did well until the evening of the following (4th) day, when he again vomited 17 ounces of brown fluid at one time, and about an hour later, 2 ounces. Again gastric lavage was begun and kept up every four hours. Except at certain times when the patient was asleep, this was kept up for two and a half days. At the end of that time the washings began to return clear and were ordered discontinued. During this period his temperature and pulse remained normal; bowels moved quite naturally, proctoclysis and nutrient enemas were given.

On two occasions during the following 4 or 5 days, he became distressed and required a lavage, but the return fluid was practically colorless in each case. Feeding was gradually resumed and the patient went home well on the 18th day after the operation.

Comment: This case illustrates another of the toxic post-operative types of gastric paralysis. Without the persistent use of the stomach tube conditions would undoubtedly have proved fatal.

CASE 8. Acute dilatation of stomach following oophorectomy for ovarian cyst. Mrs. A. G. H., age 73. This patient was of slender build; nutrition rather below normal, but otherwise in fair physical condition. She complained of a gradual enlargement of the lower abdomen, which had been noted during the previous six months. She also complained of dyspeptic symptoms and of a vague pelvic pain. On physical examination a well defined pelvic tumor was palpable in the lower abdomen.

Nov. 21, 1919. Patient was operated upon under ether anesthesia. An ovarian cyst about the size of a man's head was removed. No difficulty was encountered at the operation, and the removal of the tumor consumed but a short time.

After the completion of the operation, the

patient was returned to her room and passed a fairly comfortable day. Nothing unusual was noted in her convalescence until the morning of the third day. At 4:30 a. m. she had emesis of a moderate amount of yellowish fluid. The evening temperature on the day before was 98, pulse 75, respiration 20.

Third day. On the morning of the third day, when vomiting first took place, she had a temperature of 99, pulse 75, respiration 46. Her abdomen was rather distended; she complained of gas pains but appeared to be relieved by the passage of a rectal tube and a saline enema. Food was withheld; proctoclysis had been given from the beginning and was continued. Evening temperature 98.6, pulse 78, respiration 18.

Fourth day. Though nauseated at times, had spent a fairly good night. Temperature 98.6, pulse 78, respiration 18. Abdomen showed rather marked distention. During the day she vomited five times, the quantity varying from 4 to 8 ounces, the fluid being dark brown, and on one occasion greenish fluid with some undigested food. Evening temperature 98, pulse 75, respiration 20.

Fifth day. A fairly good night reported; no vomiting; bowels moved with an enema. Temperature 98.2, pulse 76, respiration 36. Abdomen greatly distended, especially to the left. Patient began to show signs of exhaustion; eyes sunken, and yellow waxy complexion. Gastric lavage was given. A rather large quantity of brown fluid was removed and a quantity of gas expelled through the tube. The gastric contents had a decided offensive odor. Chemical analysis showed the absence of free hydrochloric acid but gave reactions for bile and blood.

After two subsequent lavages at intervals of 4 hours the patient made an uneventful recovery.

Comment: This case represents a type of acute dilatation in which it is thought the cause is due to the sinking down of the intestines in an empty space, produced by the removal of a tumor, and thus causing traction on the root of the mesentery and thereby a compression of the horizontal portion of the duodenum.

BIBLIOGRAPHY

Brinton—Diseases of Stomach (1858).

- Fagge—Guy's Hospital Reports (1873), 3rd series 18-1-22.
 Howell—Text Book of Physiology, p. 697.
 Davis—Applied Anatomy, p. 401.
 Keen—Text Book of Surgery, pp. 843-947.
 Bassler—Diseases of the Stomach, p. 824.
 Box & Wallace—London Lancet (1901), p. 1259.
 Connor, L. A.—Am. Journ. Med. Sciences (1907), p. 345.
 Borchgrevink—Surg. Gynecology and Obst., June, 1913.
 Byrne—Journal Lancet, March 24, 1917.
 Gillett—Am. Journal Obstetrics, Dec., 1918.
 Riordan—Calif. State Journal of Medicine, July, 1917.
 Lee—Annals of Surgery, April, 1916.
 Doolin—British Journal of Surgery, July, 1918.
 Laffer—Annals of Surg. (1908) pp. 390-532.

PRE-ECLAMPTIC TOXEMIA AND POST PARTUM ECLAMPSIA*

By A. L. McDONALD
Duluth, Minn.

A recent experience with the following case of Post-partum eclampsia left a tragic impression. From the onset the condition seemed to have been utterly unavoidable and also irresistible in its progress.

Mrs. P., age 23 second pregnancy. Family history negative. Personal history; no acute illness or infection. First pregnancy about two years ago was normal resulting in spontaneous labor and a healthy child. The present pregnancy was uneventful with no excessive vomiting or evidence of toxemia. The patient had been under the care of another physician and recent urine examinations had been reported negative. She had been in usual good health up to the onset of labor which occurred at term in the early morning of Jan. 27, 1920. Being unable to reach her own physician I was called and arrived at the termination of a normal spontaneous labor. The baby was at full term, living and healthy in every respect. The placenta was expelled spontaneously and was normal. Bleeding seemed somewhat excessive so a hypodermic injection of Burrows-Wellcome "Ergotoxine" was given, resulting in a prompt reaction. The patient was left in good general condition at 8 A. M. She complained of slight distress across

upper abdomen, but as this was not severe and there was no nausea, it did not attract the attention to which it was, perhaps entitled. At noon I was called to the house and found her comatose, with a history of several convulsions. She was somewhat cyanotic, with edema of the face but none of the extremities, her breathing stertorous. She was given $\frac{1}{2}$ grain of morphine and prepared for removal to the hospital, during which time there were several severe general convulsions. On arrival at St. Mary's hospital the patient was put in a hot pack, morphine repeated and Chloral hydrate given per rectum. During the next hour there was a general convulsion about every 20 minutes, with deep coma and stertorous breathing in the intervals. At 5 P. M. temperature was 101, pulse 100, full and bounding. Blood-pressure 140-90 marked cyanosis, some edema of the face but none of the extremities. Fifteen ounces of bloody urine were obtained by catheterization, and showed only a trace of albumen and a few casts. A pint of saline was given by hypodermoclysis and continuous proctoclysis started. Without my orders chloroform had been used during the convulsions, but ether was substituted and proved equally efficient. At 10 P. M. the condition was much the same, convulsions every 20 minutes, with deep coma, stertorous breathing, marked cyanosis, and blood-pressure 140/80. 400 Cc. of blood was taken from the vein and other measures continued, followed by cessation of the convulsions, and improvement in color though she remained comatose and at no time regained consciousness. Jan. 28, 9 A. M. temperature 106, pulse 140 and weak. Cold packs and sponges seemed to control the temperature for a time but there was no response to active stimulation. Twenty ounces of rather bloody urine were obtained during the day. The patient grew progressively worse and died at 8 P. M. just 36 hours after delivery.

A partial autopsy was permitted and took place the next morning. Face somewhat bloated but there was no general edema and none in the ankles. The abdomen contained a small amount of clear fluid, and the intestines were moderately distended with gas. The uterus was firmly contracted and of usual size. Liver,

*Read before the St. Louis County Medical Society, March 11, 1920.

enlarged, extending below the costal margin, was pale yellow and mottled with numerous hemorrhagic areas scattered over the surface. On microscopic section it gave characteristic picture with areas of necrosis about the portal veins in the lobule. The kidneys were perhaps a little enlarged and markedly congested, and the pelvis contained considerable bloody urine. Capsules stripped easily and, on section, the anatomical markings stood out beautifully. Microscopical study showed normal glomeruli, congested convoluted tubules with pale cells, and the lumens contained much detritus.

There is at present, too great a tendency to class all convulsive seizures occurring late in pregnancy and during or following labor, as eclampsia. Many of them are in fact uremic rather than eclamptic. We may group such late toxemias with convulsions under three headings.

1. Uremic convulsions, characterized by high blood-pressure, edema, decreased output of urine, and findings pointing to nephritis. These are usually preceded by premonitory symptoms commonly described as "preeclamptic toxemia." At autopsy there is evidence of some type of nephritis while other findings are variable.

2. Eclamptic or hepatic toxemia, characterized only by convulsions, coma, and at autopsy by certain definite changes in the liver. Blood pressure is normal or only slightly elevated. The urinary findings may be negative, or present evidence of sudden irritation with decreased amount of urine of high specific gravity, hematuria, albumen and casts. In eclampsia *per se*, there are no recognized warnings or definite preeclamptic symptoms or signs. At autopsy in these cases the only constant and typical findings are in the liver, others being more or less incidental.

3. Hepatic or eclamptic toxemia may develop in women whose kidneys are already defective and be superimposed upon an early nephritic toxemia, in which case there will be a more or less definite pre-toxic stage with high blood-pressure, edema, eye symptoms, and urinary findings. Autopsy will demonstrate lesions in both the kidneys and liver.

One is impressed with the fact that eclampsia may and often does occur in women who are

under good observation and in whom there is no warning evidence to be obtained in the blood-pressure, urine, or the ordinary pre-natal examination. For instance, a personal communication from Dr. J. W. Harris, Resident Obstetrician at The Johns Hopkins Hospital, describes three cases which occurred recently in women who had been under regular observation and who presented none of the pretoxic signs. One of these patients had nineteen convulsions, another eleven, and the third had five convulsions following a normal spontaneous labor. The highest blood-pressure in these cases were: 108/70. 120/85. 150/90. and in but one was there enough albumen to be measured by the Esbach reagent, that showing only a trace. These women were treated for the toxemia only and all recovered.

Some patients do show more or less definite evidence of "preeclamptic toxemia," most of the findings of which point to renal deficiency rather than to liver toxemia. The condition may be said to be preuremic and not preeclamptic. One is forced to the conclusion that the urinary findings preceding or during eclampsia are somewhat incidental, unless there be organic changes in the kidneys in which case it is difficult to say that the entire condition is not uremic. In fact, in the absence of autopsy findings, the differential diagnosis between eclampsia and uremia is by no means definite or simple. We must therefore conclude that many of the attacks classed as eclamptic are in truth, uremic. In some of the cases of eclampsia which occur "Like a flash from a clear sky" with no pretoxic symptoms, there is a sudden partial or complete anuria, hematuria, with albumen or casts, in other words an overwhelming of the kidneys by toxic substances being excreted, may we assume as a result of the hepatic lesions. It is also apparent that the usual preeclamptic findings will be most evident in women whose kidneys are already defective. Therefore in such cases the condition is more likely to present premonitory evidence in the pretoxic stage so that treatment may be instituted at an earlier period with better prospect of success, whether the impending attack be uremic or eclamptic.

From a purely scientific standpoint it would

seem that clinical and chemical research on eclampsia should be limited to those cases which show a minimum of signs of renal disturbance. It is to be hoped that such work may develop some more early definite evidence of liver deficiency which may be considered as truly preeclamptic. For the present however we must accept the term eclampsia at its face value, though certain that it includes many cases of uremia with no hepatic or eclamptic toxemia.

Aside from the clinical and pathological evidence, there are a number of facts which suggest that eclampsia develops under conditions rather different from those predisposing to renal toxemia and uremia. Personal observation and conversation with obstetricians convince me that a large proportion of these cases occur during the winter months when the women are taking less exercise especially out of doors. Gessner (*Centralblatt für Gyn.* Vol. 53. No. 50.) notes that in the province of Baden for six years preceding the war, eclampsia occurred in from 1.5 to 2 instances in 1,000 confinements, but fell to 0.8 per 1,000 during the war. Also, at the Hanover Maternity the number of cases fell from : 25 in 1914 to 23 in 1915, 13 in 1916, 10 in 1917, and 7 in 1918. He ascribes this to the fact that women were working harder and taking more exercise rather than to restrictions in diet. If diet, i. e. protein and fat were important causal factors, cows whose diet is entirely vegetable should not have eclampsia. He explains this condition in cows as due to a lazy phlegmatic life, incomplete oxidation, and accumulation of fat in the tissues. He also describes a fat anemic type of woman what is predisposed to eclampsia and suggests the possible prophylactic value of thyroid and pituitary extracts.

Shears, in his interesting book (*Obstetrics, Normal and Operative*) lays much stress on incomplete oxidation in the tissues due to faulty hygiene and lack of exercise in the fresh air. His ideas are extremely suggestive.

We assume that the condition is due to the retention within the maternal organism of certain abnormal products of metabolism. These give rise to definite degenerations in the liver and later to convulsions, coma, and only sec-

ondarily to changes in the kidney. There may be either: A. Overproduction of such materials from one of two sources; 1. The product of conception. On this assumption we have to explain the fact that the convulsions and toxemia may be controlled and the pregnancy continue. Williams (textbook of Obstetrics) quotes Lichtenstein who collected 120 such cases of which 56 gave birth to dead fetuses and 64 to normal babies at full term.. We have also to explain the post-partum type of eclampsia. 2. The toxic products may be produced in the maternal organism by change of habits, lack of fresh air, and to diet, though this latter is not often much changed. B. There may be a true retention of such substances with incomplete oxidation and elimination due in great part to change of habits.

On the basis of such reasoning we must conclude.

1. Prenatal care should include supervision of hygiene and our patients must be taught the value of regular exercise and fresh air.

2. Blood-pressure and urine examinations as commonly carried out are most important in detecting early evidence of renal deficiency, but are not sufficient to give warning of impending eclampsia at least in the uncomplicated cases. For this information we shall have to await further research.

3. In view of the fact that pregnancy as such plays a more or less indirect role in the etiology, we should direct our first efforts to overcome the toxemia. This will include: control of convulsions by morphine, chloral and ether; elimination by sweating, hot packs, but most rapidly and efficiently by bleeding. Excessive dehydration must be avoided by fluids administration by rectum, subcutaneously, or intravenously. A recent article by Titus (*J. A. M. A.* Vol. 74 No. 12 p. 777) is most suggestive and establishes a logical reasoning for intensive administration of sodium bicarbonate, glucose, and carbohydrates in these cases. Radical termination of pregnancy should be undertaken only in special circumstances, and then with a keen appreciation of the difficulties and risks of rapid surgical delivery.



THE MECHANICS OF DIGESTION.*

By CHARLES N. HENSEL, M. D.
St. Paul, Minn.

Two main factors are concerned in digestion, chemical and mechanical. The chemical factor, studied and analyzed for many years, was the first source of our knowledge of digestion but apparently, in spite of all the recent advance in fractional gastric analysis, it has reached almost its height as a source of information of digestive function.

The mechanical factor on the other hand has, until the last few years, been but little studied, although a search of the literature of over a quarter of a century reveals numerous isolated observations on the mechanical activities of the digestive tract as studied in the animals.

Hess¹, in 1886 and 1887, published some interesting experiments on the varying degrees of tonus in different portions of the intestinal canal. By an ingenious method he noted that the downward pull of a balloon in the intestine was greatest near the pylorus, decreasing as the balloon progressed towards the ileum.

Other observers noted differences in the muscular thickness as well as differences in sensitiveness to stimuli in different parts of the intestinal tract.

In 1898 Bayless and Starling² formulated their law of the intestine, namely, "that excitation at any point in the gut causes contraction above and inhibition below".

A little over a decade ago Cannon³, of Boston, commenced his experiments utilizing the X-ray, just beginning to become popular, instead of the fistulous animals previously used. He fed his animals food mixed with bismuth, watching the movements of this opaque mass through the entire length of the gastro-intestinal tract by means of the fluoroscope. The animals were quickly accustomed to laboratory procedures so that the observations were made under relatively normal conditions.

Cannon's first work was directed to a study of the importance of tonus in gastro-intestinal motility and the relation of the vagus nerves to it. Having cut the vagus nerve supply to the esophagus, he noted that there was an immediate

paralysis, the esophagus ballooning out under pressure of the bismuth column without forcing it ahead into the stomach. Continuous observations, however, showed that after twenty-four hours recovery commenced to take place, tonus returned, and soon the esophagus was forcing food into the stomach apparently as well as before. Furthermore, he noted that, in the early stages, if the amount of bismuth introduced into the esophagus was small, no movement took place, but if the amount of bismuth was large, so that the walls of the esophagus were greatly distended, some of the bismuth was forced through the cardia, a small amount remaining however, which did not move.

By this experiment he demonstrated first, that the esophageal wall has within itself an inherent tonicity, and secondly, that distention is an important factor in exciting activity of the esophagus.

These experiments of vagus section were repeated on the stomach, small intestine, and later on the colon. In each case the severing of the nerve supply was followed by temporary paralysis with resumption later on of normal function, independent of the central nervous system. Severing of the sympathetic nerve supply to the gastro-intestinal tract did not alter tonus or cause temporary paralysis. Apparently the vagus increases tonus and the sympathetic relaxes tonus, and the balance between these two keeps up a proper state of tonus in the gastro-intestinal tract.

If, instead of cutting the vagus, it was stimulated, an increase of tonus was noted. Just when this tonus acts normally, without stimulation, is hard to say, but since increase of tonus causes peristalsis to appear and cutting the vagi before food is eaten causes no peristalsis, there must be a setting of tonus along with psychic secretion (as shown by Pavlov⁴) with the sight, smell and the eating of food. "After digestion is well started the vagi can be cut without altering either the nature of peristalsis or rate of gastric emptying." In some way the tonic state maintains itself.

In another series of experiments on dogs the abdomen was opened under warm normal saline and a soft mushy mass injected into the empty stomach. At these operations the stomach was not always found to be in the same condition.

*Read before the Southern Minnesota Medical Association at Fairmont, Minn., June, 1920.

Sometimes it was large, atonic and flabby and seemed to give way before the injected mass without any reaction whatever. At other times the stomach was small and contracted, and, as soon as the soft mass was injected, began to act on it with peristaltic contractions.

Here again we see the importance of tonus in its relation to motility, and by tonus Cannon means that the muscle is shortened and resilient.

Observing the progress of food through the colon, he noted the presence of a pulsating constriction ring near the ileocecal valve. This had been referred to by previous writers, but, according to Cannon, its importance had not been realized. He noted that with each pulsation of this constriction ring a wave passed down the canal.

Furthermore, he observed that if, while these waves were running along the canal, the liquid contents were almost entirely withdrawn, these waves ceased, but reappeared as soon as the fluid was reintroduced into the canal in sufficient amount to cause distention. Again we see the importance of distention as a factor in gastro-intestinal motility. If the stretching be too great peristalsis is just as promptly stopped as if the stretching be insufficient.

In further analyzing this pulsating ring we go back to the well known principle of physiologists that a muscle stimulated and responding by contraction is refractory to further stimuli during all the stage of contraction and during the first part of the stage of relaxation. It is only during the latter part of the stage of relaxation that it is again susceptible to stimulation. Consequently, if we have a constriction ring and the right degree of stretching as a source of stimuli, then as long as this stretching lasts we are going to have pulsations of this constriction ring and, from the above explanation, it must act rhythmically because the ring is not open to stimuli during its refractory period. Consequently we have added the explanation of the third factor in gastro-intestinal motility, namely, rhythmicity.

We have then three factors necessary for normal gastro-intestinal motility—tonicity of the wall, the necessary degree of stretching of this tonic wall, and the rhythmic contractions due to this stretching.

In further studies Cannon found that this

pulsating tonic ring could be made to appear anywhere in the colon by pinching the wall or by applying a weak solution of barium (which raises muscle tonus). This ring would send downward running waves and if, at the end of these waves, the colon was again stimulated by pinching, reverse waves could be started which blocked the oncoming waves. If the colon were stimulated in the middle, waves might be seen running in either direction.

Factors Varying Tonus.—Putting of food into the stomach raises its tonus above that of the intestine and peristaltic waves start carrying the food towards the pylorus, but if the entire tract be watched for a number of hours under the fluoroscope, it will be noted that while the stomach may empty to a certain point quite rapidly, there comes a period when the food will lie for some time without moving. This may be explained on the ground that food in the stomach has raised its tone above that of the intestine. When a certain amount of food has entered the intestine the tone of the intestine is likewise elevated and may be equal to that of the stomach. Consequently no movement can take place until either more food is put into the stomach or movement takes place lower down in the intestinal canal.

We must regard the entire gastro-intestinal tract as a unit and realize that, though separated by many feet of small intestine, the stomach and cecum are in reality very close together through their nerve supply and that what goes on in one part is reflected by the other.

"Roith" describes two cases in which rectal injections brought about movements in the upper colon although the bowel in between had been completely severed."

Alvarez' noted on graphic records ripples running from pylorus to cecum in a few seconds. Roentgenologists have observed that putting food into the stomach sometimes causes material to pass through the ileo-cecal valve or rush through the colon.

Some individuals experience a desire to go to stool immediately after meals. One of my cases had to go to stool immediately if he ate strawberry jam with his meal.

The character of the food taken likewise has its effect on tonus. Patients who have vomited liquids repeatedly, may cease to vomit if given

solid food. This is often true in post-operative cases where, as will be shown later, the trauma of the operation may have elevated intestinal tone. Apparently the solid food raises gastric tone sufficiently to overcome the reverse peristalsis and set the current running downward again.

Pleasurable psychic stimuli likewise have a tonus-raising power. This is seen in the activity of the stomach of a hungry dog on the taking of food, while Haudik and Steiler⁸ noted slow gastric emptying when food is taken without appetite.

Effect of Irritating Lesions.—Any irritating lesion in any part of the intestinal tract will raise the tonus of that portion above the normal, will retard the current coming towards it, and hasten the current going from it. If there is any lesion in the region of the ileo-cecal valve, such as chronic appendicitis or adhesions, it will raise the tonus of this portion of the gut above normal and prevent the normal progress of the food through the small intestine, raising the tonus backward all along the line and bringing about a slow gastric emptying referred to above.

Smithies⁹ says "of 482 cases of gastric stasis due to ascending influences only 21 showed retention after removal of appendices or restoration of natural conditions in the bile tract".

Aaron¹⁰ in fluoroscopying a case of chronic appendicitis noted that pressure over McBurney's point caused epigastric pain and pylorospasm.

These clinical observations were substantiated by experiments of Hedbloom and Cannon¹¹. They irritated the cecums of cats with croton oil and found that on the following day the animal's stomach emptied very slowly in spite of active gastric peristalsis, and that there was great slowing of the current in the small intestine as well.

In the above experiment, apparently the local raising of tonus in the gut wall, following injury, has a protective effect on the injured gut in not allowing material to come near it. Cannon and Murphy¹² noted that directly after high intestinal section and suture, while gastric peristalsis was not interfered with, the pylorus remained tightly closed for almost 6 hours after recovery from anesthesia and did not permit food to pass into the injured gut. He comments

on the coincidence between this period of delay and the time required for the primary healing of the intestinal wounds. Undoubtedly some of the so-called post-operative ileus may be due to trauma of the gut during operation and is Nature's way of protecting the canal until the acute results of injury have subsided.

In some individuals frequent feedings do not work well because, in spite of the increased tonus due to the repeated putting of food into the stomach, the tone of the colon is so high that the food does not move along and consequently the stomach does not empty properly. These people will often regurgitate food or vomit from these frequent feedings. If, however, in these cases the current through the colon can be speeded they will take care of the increased number of feedings with great benefit. This is more likely to occur where something has raised the tonus of the colon, such as adhesions around the cecum and lesions around the rectum and anus.

Roentgenologists frequently attest the fact that any irritating lesion in the region of the pylorus will speed the current through the entire canal; some of them going so far as to say that the presence of the head of the bismuth column in the descending colon within six hours is pathognomonic of a lesion in the region of the duodenum such as chronic gall bladder, pericholecystitis adhesions, or pancreatic disease.

So much for irritating lesions and food in the upper portion of the tract. We have seen how the putting of food into the stomach raises its tonus above that of the intestine. We may likewise see how the putting of food into the rectum will raise its tonus above normal. This has been frequently observed in attempts at rectal feeding. The tonus of the descending colon may be so elevated above normal that reverse peristaltic waves may be started and cramps, nausea and even vomiting ensue.

Rolliston and Jex-Blake¹³ out of 96 cases collected from the literature of gastric ulcer fed by rectum alone found that nausea, colic or vomiting occurred in 26 (about 25 per cent) and in most of these 26 cases even colonic flushing caused nausea.

Of irritating lesions in the region of the rectum, hemorrhoids and fissures are the most common. These elevate the tonus of the descending

colon so that the feces are held back out of the ampulla of the rectum and even gas does not easily pass out through the rectum but accumulates at the splenic flexure. Alvarez says "this is so constant a finding that I have come to regard a large tympanitic Traube's space as almost diagnostic of hemorrhoids."

Case¹¹ of Battle Creek believes he has demonstrated roentgenologically that adhesions of the pelvic colon, where it crosses the left psoas and dips into the true pelvis, are a source of chronic constipation in many women because they prevent the ampulla of the rectum from filling normally and thus the rectal stimulus for stool is absent. I believe that both factors, namely, adhesions of the pelvic colon and irritating lesions around the rectum, may be responsible for constipation in many individuals.

Soper¹² speaks about the relief of constipation in a large proportion of his patients from the use of local applications to the rectum and sigmoid through the proctoscope of a saturated solution of magnesium sulphate which relaxes muscular spasm.

There is still a condition which has not been adequately understood, commonly known as spastic constipation, manifested symptomatically by alternating attacks of constipation and diarrhoea, by frequent passage of narrow flat ribbon-like stools and occasional attacks of intense left-sided colic relieved shortly by the taking of a slowly given, intensely hot enema or a hypodermic of morphine. In these cases the descending colon may be palpated as a narrow, finger-like cord in the left flank and fluoroscopy reveals a small narrow descending colon and sometimes a transverse colon without the usual haustral segmental markings. This condition sometimes seems to follow great nervous strain, mental anxiety and the frequent taking of irritating cathartics to relieve chronic constipation.

Alvarez¹³ has shown so well how this latter condition may occur by his experimental studies on the purging of rabbits. These animals were given doses of the usual irritating cathartics such as castor oil, jalap, magnesium sulphate, etc., proportional to their body weight, and their colons were removed at autopsy 21 hours later. In some cases the descending colon was found contracted to a hard white cord with a very nar-

row lumen; in other cases the colon was atonic and flabby, was filled with a watery fluid, and the mucosa inflamed and congested with small ecchymotic hemorrhages scattered throughout. Excised segments in Ringer's solution showed weak and irregular contractions and were less sensitive to drugs applied locally.

CONCLUSIONS

To recapitulate: To have an edequate understanding of the mechanical factors concerned in digestion we must think of the gastro-intestinal tract as a unit from mouth to anus, realizing that what goes on in one portion of the tract may be reflected in the activity of another portion quite remote from it; that the progress of food is conditioned on the state of muscular tonus of the walls of this tube; that, given a state of tonus, a requisite amount of distention is essential to bring out intestinal activity; and that, given distention, rhythmical waves will ensue; that variations in the normal progress may occur, due to abnormal elevation of tonus through irritating lesions; and that the whole progress is dependent upon a balancing of forces between one portion of the tract and another; that the vagus nerves send tonic impulses to the entire tract as far as the middle portion of the colon, while fibres to the descending colon and rectum come from the 2nd to 4th sacral nerves, but that the tract has apparently an inherent capacity within itself of maintaining tonus; that irritating lesions in the region of the rectum will raise the tonus of this portion above normal and slow a current coming towards it and even bring about nausea and vomiting; and that lesions around the cecum act in a similar manner.

"Briefly, gastro-intestinal symptoms are motor symptoms that arise when normal progress of food is disturbed, namely, speeding, slowing, stoppage and reversal."¹⁴ If one can once grasp these ideas of the alimentary canal, many of those obscure problems that have baffled explanation in the past will be made clear and treatment directed along these lines will yield surprisingly satisfactory results.

BIBLIOGRAPHY

1. Hess: *Deut. Arch. j. Klin. Med.*, 1886-7, xi, 105.
2. Bayless & Starling: *Jour. Physiol.*, 1899, xxiv, 110.
3. Cannon: *The Mechanics of Digestion*. 1911. Longmans Green & Co.
4. Pavlov: *Work of the Digestive Glands*. London 1902. p. 50.

5. Quoted from Cannon: *Mechanics of Digestion*. p. 200 (Loc. Cit.)
6. Roith: (Quoted, by Alvarez), *Jour. A. M. A.* July 31, 1915, p. 389.
7. Alvarez: *Jour. A. M. A.* July 31, 1915, p. 388.
8. Haudik & Steller: (Quoted by Alvarez), *Jour. A. M. A.*, July 31, 1915, p. 389.
9. Smithies: *Amer. Jour. Med. Sciences*, 1915.
10. Aaron: *Jour. A. M. A.*, May 29, 1915, p. 1845.
11. Hedbloom & Cannon: (Loc. Cit. 3, page 127.)
12. Cannon & Murphy: (Loc. Cit. 3, p. 126.)
13. Rolliston & Jex-Blake: *Brit. Med. Jour.*, 1903, ii, p. 68.
14. Case: *Jour. Mich. State Med. Soc.*, April, 1917.
15. Soper: *Amer. Jour. Med. Soc.*, August, 1918.
16. Alvarez: *Surg. Gyn. & Bos.* June, 1918.

Also

DISCUSSION

DR. GEORGE D. HEAD, Minneapolis: I appreciate very much being called upon to discuss this subject because it is a matter of importance. Dr. Hensel, in his analytical way, has gone to the root of the subject. I am quite sure it is a very good sign when we are willing to take up these matters relating to the functional side of digestion and discuss them from the standpoint of the facts as they have been demonstrated by experimentation.

I sometimes feel that in our desire to advance our knowledge so rapidly we forget the things that have already been taught and learned, and it is a good plan occasionally for the young men, as well as the men with gray hair, to go back over the work of previous observers, cull over the literature, and learn really what is known.

Three names come to my mind as pioneer observers or men who have contributed a great deal to the subject of the neuro-circulatory side and secretory side of the digestive apparatus. The first and foremost of these, and one I am sorry Dr. Hensel did not mention, is our great American gastro-physiologist, Dr. Beaumont, who did his work in the first part of the nineteenth century, and whom none of us should ever forget, because I believe he has contributed more to our actual knowledge concerning gastric digestion than any one of the observers and experimenters who has succeeded him.

The second man to whom we are greatly indebted is the Russian observer and experimenter, Pavlov, who has contributed much in his experimental work upon dogs by the production of an artificial accessory stomach. He has been able to study the secretory activity, the absorptive power, and the movements of the gastric wall in these so-called accessory stomachs.

And the third man to whom we are indebted and the one whose work Dr. Hensel has mentioned most frequently is Dr. Cannon, of Boston.

I want to say a word or two about Beaumont's observations. You will recall, if you have read the life of Beaumont, his observations upon his patient St. Martin, who sustained a gunshot wound of the

lower chest and abdomen, which produced a hole in the stomach high enough so that, when it healed, a trap door was formed over the opening in the stomach wall. By pushing down this little door or portion of tissue that grew over the opening in the stomach, Beaumont was able to study St. Martin's digestion. The observations were not made upon a dog or other animal, or upon a sick person, but upon a strong, healthy man. Beaumont observed a lot of things, and I happen to have at home the little brown book in which Beaumont first reported his observations, a few copies of which are still in existence. I take down that book frequently and read over and over again his observations. If you can get hold of it, I think you should read it from cover to cover.

Beaumont observed that if St. Martin was ill with any infectious disease, like a severe cold or tonsillitis, and was fed with the usual foods, the meal ingested would lie for hours practically unaltered in the stomach, much as if St. Martin had swallowed a stone. Instead of the normal pink appearance of the mucous membrane with the elevated red papillae projecting above the surface of the stomach wall, which was usually seen following the taking in of a meal by St. Martin, the mucous membrane, when he was sick, took on a dark, angry looking appearance, and was covered with a grumous, mucoid material. If St. Martin became angry—and he frequently did whenever Dr. Beaumont would ask him to perform some service for him, since St. Martin lived with Beaumont for years, during which time these observations were made—the food would lie for hours sometimes in an undigested or partially undigested state, and did not pass on into the duodenum until such time as St. Martin had recovered his normal state. These observations, and many others made by Beaumont, illustrate what Dr. Hensel has pointed out with relation to the facts controlling the secretory activities of the stomach and of the intestinal tract.

The facts relating to the control of the secretory activities of the stomach remain yet to be determined, whether these disturbances of secretion depend upon altered states of the internal secretions or glands outside of the stomach, or whether it is a question of vasomotor control of the circulatory supply in the stomach wall, or of the secretory glands in the stomach itself remains still to be determined. I do not think anyone knows, but the practical point is that there is a very large and important factor entering into the act of digestion in all of us, which we do not understand, which we call nervous control, but which plays a very important role. It lies at the basis of fully one-half of the gastrointestinal disturbances which we as physicians are called upon to treat.

DR. HUGH S. WILLSON, Minneapolis: There are two points I would like to bring out in regard to gastrointestinal motility.

The first is the relation of motility to gastric acidity and the probable acid control of the pylorus. With high acids the emptying time of the stomach

is slower and the head of barium column in any given time will be less advanced than in cases with low acids or achylia. This has been so obvious that oftentimes a fair estimate of gastric acidity can be made by observing the position of the head of the barium column in six hours.

The second point is in relation to colonic motility. After several years of constant observation of the barium meal in the colon I have never seen any but mass movement and that is comparatively rarely seen. We are always able to tell when a mass movement is about to take place by observing a mass of barium which has separated and in which all of the Haustral markings are wiped out leaving a banana shaped body. Within a few moments this mass will take on a rather rapid movement, traveling anywhere from a few inches to two or three feet. If no further movement is to take place for the time being the Haustral markings will then disappear.

DR. GEORGE EUSTERMAN, Rochester: Naturally we are watching to see if the physiologist can not help us in the elucidation of some of these problems. In the first place, I think the physiologist has been too prone to work out his problems by following his own conception of what they should be; that the clinician has not been consulted enough is usually shown by the fact that Cannon says gastroenterostomy is an imperfect operation, and that pyloroplasty is more perfect. In our experience the opposite is true. Based on the treatment of sick human beings, we must remember, at all times, that treating animals and sick human beings are different propositions.

The second observation concerns the pain of ulcer. The physiologist maintains that in ulcer the pain is intermittent. We know the pain of ulcer is invariably a continuous pain, and perhaps on that account some of these conclusions may be questioned.

With reference to achylia, a patient may have gastric disturbances without local symptoms unless motility is disturbed. By peristalsis we understand a rhythmic contraction of the stomach wall around its contents.

Dr. Head brought out an important point, namely, that the practical factors should not be overlooked in some of these motor functions. In connection with peristalsis we have factors that are both mechanical and psychic. On the basis of new investigations, it seems to me, the mechanism of peristalsis is not repeated in the stomach wall but in the duodenum and depends on the location of the caps. By tonus we now understand the ability of the stomach wall to contract around its contents at all times.

In connection with the observations of Dr. Cannon, Dr. Carman tells me that shortening of the diameter which Cannon has seen in the experimental animal does not obtain in the sick human being. He speaks of the dog's stomach as being elevated and the long axis of the stomach contracts. That is not true in the human patient.

CHAS. N. HENSEL, St. Paul: (Closing the discussion): Realizing that this factor of gastro-intestinal motility is not stressed enough in the literature and believing in its value as an aid to diagnosis. I brought the matter to your attention today. There is so much to be said on this subject that I can only give you a bird's-eye view of it.

As Dr. Head has said, Beaumont was indeed the pioneer along with Pavlov, but their work was necessarily limited chiefly to the chemical side of digestion for this was about all they could observe through fistulae. Cannon, on the other hand, using the X-ray, had the advantage of studying the entire gastro-intestinal tract at one time, thus proving that the digestive tube acts as a unit—a fact that seems to have been but little appreciated. Cannon's work was not by any means confined to animals, the findings on animals being verified on man as well. Alvarez, in San Francisco, for the past half decade has been satisfactorily applying these ideas in a large clinical practice, but the profession generally still seem loath to put into daily use these ideas. The research laboratory has given us much valuable information but we have not had the wit to use it.



MINNESOTA MEDICINE

Owned by

The Minnesota State Medical Association.

PUBLISHED BY ITS EDITING AND PUBLISHING COMMITTEE

R. E. FARR, M. D. H. LONGSTREET TAYLOR, M. D.

Minneapolis St. Paul

L. B. WILSON, M. D. F. L. ADAIR, M. D.

Rochester Minneapolis

J. T. CHRISTISON, M. D., St. Paul

EDITORIAL OFFICE

CARL B. DRAKE, M. D., Editor

1300 Lowry Bldg., St. Paul

BUSINESS MANAGER

J. R. BRUCE, 403 Central Bank Bldg., Saint Paul

Telephone: N. W. Cedar 1683

All correspondence regarding editorial matters, articles, advertisements, subscription rates, etc., should be addressed to the Journal itself not to individuals.

All advertisements are received subject to the approval of the Council on Pharmacy and Chemistry of the American Medical Association.

Subscription Price: \$3.00 per annum in advance. Single Copies 25c
Foreign Countries \$3.50 per annum.

Vol. III October, 1920 No. 10

EDITORIAL

VIENNA PHYSICIANS

Poor Vienna. Reports from all sources give a picture too awful to comprehend, of the misery in the once gay and lighthearted city. Must we actually go there and see with our own eyes to be moved to help our fellow physicians there?

It seems to some almost like a providential retribution that Vienna should be forced to pay such a penalty, following a war that the Austrian government was so instrumental in forcing upon the world. Shall we, however, let our fellow physicians and their families starve?

American physicians and American medicine have peculiarly benefited by an intimate contact with the profession in Vienna. It has been estimated that some two hundred Minnesota physicians have personally studied in Vienna. How many who have means to spare, have lifted their little finger to help the starving members of their own profession?

Spasmodic attempts have been made in isolated cities in the United States for Vienna relief. A local committee in Chicago has raised a considerable amount since the Armistice (we are still at war, which automatically prevents Austrian immigration) and as contributions included those from without the profession, relief was extended outside the profession in

Vienna. An "American Relief Committee for Sufferers in Austria" has been established with headquarters at 261 Madison Avenue, New York City. Frederick C. Penfield, former American ambassador to Austria, is the honorary chairman.

A special fund for the aid of Vienna physicians alone has been created by this committee. If you possibly can, send a check to the treasurer of this committee, Alvin W. Kreeh, President Equitable Trust Company, 37 Wall Street, New York City.

DR. GEORGE MILLER STERNBERG

The name of Dr. Sternberg will ever be associated with that of Dr. Gorgas as the activities of these two most unusual men were strikingly similar. They were leaders in the same period of medical history—a period made remarkable by the discovery of the role played by micro-organisms in respect to disease and particularly epidemiology.

Dr. Sternberg entered the army in 1861 and served with the Union forces through the Civil War, in various Indian campaigns and as surgeon general from 1893 to 1902, which period included the Spanish-American War.

He proved throughout his career to be anything but a narrow army doctor. Interested from the start in bacteriology and disinfection it was he that discovered the pneumococcus and first demonstrated in this country the organisms of malaria, cholera and tuberculosis. His interest in yellow fever began at Governor's Island, New York, and he fought many epidemics of the disease in our sea-board cities and unquestionably saved the country untold losses from the disease. He at one time contracted the disease himself. He was a member of the first Havana yellow fever commission and studied the disease extensively in Cuba, Mexico and Brazil.

In 1900, when surgeon general, he appointed the Yellow Fever Board which, under Dr. Walter Reed, conducted the experiments that so conclusively proved the mosquito to be the carrier of the yellow fever organism. It was he who founded the Army Medical School, organized the Army Nurse Corps and the Dental Corps, and established many military

hospitals including the tuberculosis hospital at Ft. Bayard.

In his later years he devoted himself to social service work and the city of Washington has benefited much in the improvement of living conditions and in the tuberculosis situation as a result of his activities.

Dr. Sternberg was one of the great medical men of the country and owed much in the way of assistance and encouragement to his wife. She has recorded his activities in book form which will serve as an accurate account of the career of one of America's foremost medical men.

THE BABCOCK AMENDMENT

The State Constitutional Amendment No. 1, introduced by Mr. Babcock, will be voted upon November 2nd. The salient features of the amendment are given for the benefit of the physicians of the State.

The primary feature of the new law is, that ordinary taxation is not to be increased but automobile owners are to pay on an average eighteen dollars per car per year, which tax will finance a most complete system of main highways throughout the state. This tax will vary according to the horse power and value of the machine and will go into a sinking fund which will be used to pay the interest on bonds and in time the bonds themselves. The amendment merely authorized the legislature to issue the necessary bonds not in excess of \$10,000,000 a year nor to total more than \$75,000,000. At present this tax of eighteen dollars per vehicle will raise some \$5,000,000 and make a hitherto unavailable Federal Aid Allotment of \$2,840,000 possible. If the number of machines in the state increase in the next few years at the rate they have in the past two, the mark of \$10,000,000 will soon be met yearly.

The money raised from this source is to be used for the Trunk Highway System. If the amendment is adopted county appropriations now turned into the state will be used locally by each county.

The scheme is a good one. While the individual auto tax may seem large, eighteen dollars is a small item in the expense of operating a machine as most of us know. The eighteen dollars and more will be saved on wear and

tear if any considerable country driving is done.

The value of good roads was recognized by the Romans. The good roads of France probably saved Paris in the late war. Good roads today are more essential than ever on account of the motor car. Good roads reduce the disadvantage incident to distance.

In the physician's sphere of activity, good roads are of primary importance. The county physician knows how short-lived his car is, simply on account of bad roads. They delay him at times when speed is a life saving proposition.

When it comes to medical meetings we have experienced the delays caused by the poor roads throughout the State. Those of us who have spent a vacation touring know how inferior our roads are to our sister state, Wisconsin.

Let us vote for the Babcock Amendment November 2nd.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

RED RIVER VALLEY MEDICAL SOCIETY

The Red River Valley Medical Society held its mid-summer meeting at Warren, Minnesota July 12, 1920.

The meeting was in point of attendance one of the largest in the history of the society.

The program consisted of clinics at the Warren Hospital and the following excellent papers:

1. Some Obscure Bone Lesions—Dr. Emil Geist, Minneapolis, Minn.
2. Observations on Extra-uterine Pregnancy—Dr. Theodor Bratrud, Warren, Minn.
3. Health Survey of Marshall County—Miss Elizabeth Hanson, R. N., County Nurse, Warren, Minn.
4. Differential Diagnosis of Pulmonary Tuberculosis—Dr. M. George Milan, Thief River Falls, Minn.

Special entertainment was provided for the visiting ladies.

SOUTHERN MINNESOTA MEDICAL ASSOCIATION

The annual meeting of the Southern Minnesota Medical Association will convene at Mankato, Minnesota, November 29th and 30th, 1920. The following are members of the Program Committee: Dr. A. F. Schmitt, Chairman, Mankato; Dr. H. W. Meyerding, Rochester, and Dr. E. M. Hammes, St. Paul.

ST. PAUL CLINIC WEEK

St. Paul has decided to hold a Clinic Week from Jan. 10th to 15th, inc., 1921. Nine large hospitals will

be available for clinics and two scientific and one social meeting will make up the evening programs. Details and tentative program will be given in our next issue. Dr. F. J. Plondke, Lowry Bldg., St. Paul is Chairman of the Committee on Arrangements.

OBITUARY

DR. HOWARD LANKESTER

Dr. Howard Lankester for twenty-five years one of the best known physicians in St. Paul died July 30th at Columbia Hospital, Milwaukee. He was within a few months of being 75 years old. He was born in England and came to America in 1887. He began the practice of medicine in Grand Forks, N. D. About 25 years ago he settled in St. Paul. He served as City Health Commissioner from 1910 to 1914. In October, 1918, when the influenza was at its height, Dr. Lankester, although 72 years of age, volunteered his services to the government. In 1919 he retired and went to Louisville, Ky., to live with his son. He was on his way to visit his daughter in Milwaukee when he became seriously ill. His widow, two sons and one daughter survive him.

DR. VAN WILCOX

Dr. Van Wilcox died at the age of 48 years at his home in Minneapolis, July 20, 1920. He is the son of the late Dr. M. R. Wilcox of Henderson, Minn. Dr. Van Wilcox after graduating from the University practiced out west, returning to Minneapolis about fifteen years ago. He is survived by his widow, one son, and a brother, Dr. M. Russell Wilcox of Minneapolis.

DR. J. C. FITCH

Dr. J. C. Fitch, for more than fifty years a practicing physician of Hastings, died at his home on July 23, 1920. He was born in Fitchville, Ohio, in 1841. He was a graduate of the Rush Medical College and was a veteran of the Civil War. He was married to Miss Frances Smith in Sharon, Ill., in 1867. He is survived by his widow and one daughter.

DR. BURTON J. MERRILL

The sudden death on July sixteenth of Dr. Burton J. Merrill of Stillwater, came as a shock to his many friends in the Northwest, notwithstanding the fact that he had been afflicted for several years with heart trouble.

Dr. Merrill was born in 1856 in Palmyra, Iowa and was a son of Philo and Sophira (Woodward) Merrill. He was educated in the public schools of Grinnell, Iowa and graduated from Grinnell College in 1875. He received his M. D. at the Bellevue Hospital Medical College, N. Y. in 1881 and moved to Hudson, Wis-

consin. In 1882 he was married to Cornelia A. Merrill and moved the same year to Stillwater.

In early days Dr. Merrill was Professor of Therapeutics and Materia Medica of the St. Paul Medical College and served as County Physician and Coroner of Washington County and also at one time as City Health Commissioner. He was also for a number of years Physician and Surgeon of the Minnesota State Prison.

NEW AND NON-OFFICIAL REMEDIES

During August the following articles have been accepted by the Council on Pharmacy and Chemistry for inclusion in New and Non-official Remedies:

Armour & Co.:

Corpus Luteum Tablets—Armour 5 grains.

Diarsenol Co.:

Sodium Diarsenol.

Sodium Diarsenol 0.15 Gm. Ampules.

Sodium Diarsenol 0.3 Gm. Ampules.

Sodium Diarsenol 0.45 Gm. Ampules.

Sodium Diarsenol 0.6 Gm. Ampules.

Sodium Diarsenol 0.75 Gm. Ampules.

Sodium Diarsenol 0.9 Gm. Ampules.

Sterile Solution of Lutein-H. W. D.—Each cubic centimeter contains the water-soluble extract of 0.2 Gm. lutein-H. W. D., freed of protein in physiological solution of sodium chloride. (for a discussion of the actions and uses of ovary preparations, see New and Non-official Remedies, 1920, p. 201.) The solution is supplied in the form of Ampules Sterile Solution of Lutein-H. W. D., containing 1 Cc. Hynson, Westcott & Dunning, Baltimore.

Ovarian Residue-H. W. D.—The residue from the fresh ovary of the hog, after the ablation of the corpus luteum. Ovarian Residue is used for the same conditions as the entire ovarian substance, but is claimed to have the advantage of being somewhat more stable. Ovarian Residue-H. W. D. is supplied in the form of 5 grain tablets only. Hynson, Westcott & Dunning, Baltimore (Jour. A. M. A., Aug. 7, 1920, p. 378).

Benzyl Benzoate-Seydel.—A brand of benzyl benzoate complying with the tests and standards of New and Non-official Remedies. For a discussion of the actions, uses and dosage of benzyl benzoate, see New and Non-official Remedies, 1920, p. 48. Seydel Manufacturing Company, Jersey City, N. J.

Tablets Anterior Pituitary—Armour 5 grains.—Each tablet contains 5 grains of desiccated pituitary substance (anterior lobe) Armour (See New and Non-official Remedies, 1920, p. 207). Armour & Co., Chicago.

Tablets Ovarian Substance—Armour 5 grains.—Each tablet contains 5 grains of Ovarian substance—

Armour (See New and Non-official Remedies, 1920, p. 202). Armour & Co., Chicago.

Riodine.—A 66 per cent solution in oil of an iodine addition (see Iodine Compounds for Internal Use, New and Non-official Remedies, 1920, p. 143). Riodine is supplied only in the form of Riodine Capsules 0.2 Gm. E. Fougere & Co. Inc., New York (Jour. A. M. A., Aug. 14, 1920, p. 477).

PROPAGANDA FOR REFORM

Internal and External Antisepsis.—Despite the numerous efforts to demonstrate the efficacy of this or that chemical agent or drug as a gastro-intestinal antiseptic, the outcome has been that the supposed benefits were due to catharsis in most instances rather than to any real effect upon the bacteria in situ. Similarly, J. F. Norton, in an investigation made for the Council on Pharmacy and Chemistry, has shown that the value of "antiseptic" and "germicidal" soap depends on the soap and not on the antiseptic or germicide contained in them. In fact, ordinary toilet soap and the green soap used by surgeons was more efficient, evidently because the added antiseptics and germicides interfered with the lathering qualities of the soap (Jour. A. M. A., Aug. 14, 1920, p. 478).

Quinin and Urea Hydrochlorid for Local Anesthesia.—Quinin is a protoplasmic poison, and tissue necrosis may be caused by strong solutions of quinin salts. That this deleterious reaction actually does occur and has mitigated against the general use of quinin and urea hydrochlorid is confirmed by the report of the Committee of the A. M. A. on the Advantages and Disadvantages of Local Anesthesia in Nose and Throat Work. The committee reported that the only local anesthetic that produces edema and sloughing is quinin and urea hydrochlorid. The committee found that, as this local anesthetic has been abandoned in other fields of medicine, so it has been discarded for use in nose and throat operations. Two physicians who had published articles extolling the value of quinin and urea hydrochlorid in nose and throat operations now state that they have discontinued its use, though they had not published this unfavorable conclusion (Jour. A. M. A., Aug. 21, 1920, p. 559).

Value of Schick Test.—The Schick test, which can readily be applied to a large number of persons, makes it possible to differentiate those immune from those susceptible to diphtheria. It also facilitates the attempt to increase the number of the immune by suitable prophylactic toxin-antitoxin injections. By the use of the Schick test and toxin-antitoxin injections, institutions have been kept free from cases of diphtheria for years (Jour. A. M. A., Aug. 21, 1920, p. 545).

Silver Salvarsan.—According to a report of the Medical Research Committee of Great Britain, silver salvarsan is apparently a molecular combination of arsphenamine and silver in some form. The sub-

stance is on trial, and its promiscuous use at this time would be ill advised. In the United States no license for the sale of silver salvarsan has been granted by the Treasury Department and hence it may not be sold in interstate commerce (Jour. A. M. A., Aug. 28, 1920, p. 626).

Iodex and Liquid Iodex.—The A. M. A. Chemical Laboratory examined Iodex in 1915 and found that it contained only traces of free iodine, though claimed to contain "5 per cent therapeutically free iodine". Even the total quantity of iodine was shown to be only about one half of the 5 per cent claimed to be present as free iodine.

OF GENERAL INTEREST

Dr. B. Soroze of Minneapolis will locate at Moorhead.

Dr. H. A. Miller of Minneapolis has moved to Waseca.

Dr. Bernt Odegard of Minneapolis will locate in Albert Lea.

Dr. C. H. Clark formerly of Duluth has located at Greenbush.

Dr. A. Sommerfeldt of Greenbush has gone back to Norway to live.

Dr. R. M. Evans of Rochester has gone to Brazil where he will practice.

Dr. J. G. Havens formerly of Cloquet and Owatonna has joined the Austin Clinic.

Dr. R. I. Stewart of Minneapolis has taken over Dr. O. S. Levin's practice at Wendell.

Dr. A. F. Branton of Willmar, and Miss Helen Tompkins of Mankato were married on Aug. 3rd.

Dr. H. A. Fasbender will locate in Hastings. He graduated from the University of Minnesota in 1919.

Dr. John H. Dorsey of Glencoe has gone to his old home at Grantsville, Maryland, where he will practice.

Dr. O. W. Scholpp has returned to Hutchinson from Chicago where he has been taking post graduate surgical work.

Dr. F. M. Dryden of Hallock has just returned from the east where he took a post graduate course in diseases of the eye, ear, nose and throat.

The physicians of Redwood and Brown counties have formed a medical society to be known as the Redwood-Brown County Medical Society.

Dr. G. A. C. Cutts has become associated with Dr. W. E. Chapman of Litchfield. Dr. Cutts was formerly located at Grove City and has spent the last year in California.

Drs. E. J. Huenekens, Max Seham and C. R. Moriarty announce that they will hereafter be associated in the practice of diseases of children at 538 LaSalle Bldg., Minneapolis.

Dr. H. W. Hill, formerly with the Minnesota Public Health Association, is now Director of the Institute of Public Health, Western University, Toronto, Ontario, Canada.

Dr. Hal Downey, Professor of Animal Biology in the Medical School of the University of Minnesota, has been engaged for a month in research work at the Mayo Clinic.

Dr. E. P. Lyon, Professor of Physiology in the University of Minnesota, will deliver a Mayo Foundation Lecture on "Physiologic effects of humidity," September 29 at the Mayo Clinic.

Dr. Iver F. Selleseth has resumed civil practice and announces the opening of his offices at 820 Donaldson Bldg., Minneapolis. He will limit his practice to orthopedic surgery.

A group of some twenty physicians of St. Paul have instituted plans for practicing their profession as a group. They will form the staff of the new Miller Memorial Hospital in St. Paul and will office in the Lowry Building.

Dr. F. W. Gaarde, formerly a member of the staff of Rush Medical School, has joined the medical staff of the Mayo Clinic as First Assistant in the Section on Diseases of the Thorax.

The Osler Society for the study of Medical History has been organized by a group of twelve men in the Mayo Foundation. Dr. W. C. MacCarty, Associate Professor of Pathology, has been chosen president.

Dr. Udo J. Wile, Professor of Dermatology and Syphilology in the Medical School of the University of Michigan, lectured last month at the Mayo Clinic on "A study of the spinal fluid in 1869 cases of syphilis at all stages."

Dr. Leonard G. Rowntree, Professor of Medicine in the Medical School of the University of Minnesota, and Dr. Reginald Fitz, associate in medicine of the Massachusetts General Hospital, have joined the staff of the Mayo Foundation and the Mayo Clinic at Rochester, Minn. Drs. Rowntree and Fitz will be associated in the further development of research in internal medicine and in the hospital care of medical cases in the Mayo Clinic.

The Graduate School of the University of Minnesota will offer a nine months' preliminary course of graduate work in ophthalmology and otolaryngology. The course will consist chiefly of advanced work in the science departments, giving fundamental training essential to this specialty. The course is not intended to prepare students to enter private practice, but is designed to serve as a basis for further thorough clinical training. Such training may be obtained by service as resident in a special hospital, or by acting as assistant in a clinic of recognized standing, or by service in a fellowship under the University of Minnesota Graduate School plan. The course will begin September 29. Requests for information should be addressed to the Dean of the Graduate School, University of Minnesota.

PROGRESS

Abstracts to be submitted to Section Supervisors.

MEDICINE

SUPERVISORS:

F. J. HIRSCHBOECK,
FIDELITY BLDG., DULUTH.

THOMAS A. PEPPARD
LA SALLE BLDG., MINNEAPOLIS

INFLUENZA IN THE TUBERCULOUS: Morris Fishberg & Ernst Boas, (Amer. Jour. of Med. Sc., Aug., 1920). Fishberg has constantly since the war upheld his belief that the relationship between influenza and tuberculosis is merely incidental, and that influenza as a precursor or an activator is a nearly negligible element. With his experience at the Montefiore hospital, during the recent epidemic in January and February of 1920, he had a morbidity of 28 cases of influenza in 127 tuberculous patients, the proportion being about the same as in non-tuberculous individuals exposed to infection. From his experience also he shows that the stage of tuberculosis has no influence on the liability of the patient to contract influenza. Of the 28 patients, however, who contracted the disease, 9 died, and 22 developed bronchopneumonia, an incidence of bronchopneumonic development higher apparently than is usually seen in uncomplicated influenza. In 1918 his experience was that the tuberculous patients relatively showed less tendency to bronchopneumonia than the non-tuberculous. In the epidemic of 1920, however, this has not been the case, and the tendency to its development seemed to be more noticeable. The clinical course of influenza was similar to that in non-tuberculous patients, and there seemed to be no relationship whatever between the clinical form of tuberculosis and the development of influenza; neither did he note any definite tendency to complicating conditions as a result of the concomitant influenza infection.

F. J. HIRSCHBOECK.

SURGERY

SUPERVISORS:

E. MENDELSSOHN JONES
LOWRY BLDG., ST. PAUL.

VERNE C. HUNT,
MAYO CLINIC, ROCHESTER.

AFTER CARE IN SUPRAPUBIC PROSTATECTOMY—SOME NEW FEATURES: T. L. Deavor (Amer. Jour. of Surg., Vol. 34, No. 7) compares the suprapubic and perineal methods in order to bring out the features of postoperative care. The advantages of the former operation are, in his opinion, as follows:

1. Entire field open to inspection and within easy reach. Rectal pressure elevates the prostatic region. In cases of sepsis it is the first stage in a two stage operation. 2. Complications, that is hemorrhage, stone, prostatic bar, easily handled. 3. Gland is just as easily accessible. 4. No more damage need be done to the prostatic urethra. 5. Drainage both ways may be used. 6. Catheter may be fixed in bladder. 7. Wound well placed for subsequent drainage, away from the rectum. 8. Fistula almost unknown. 9. Mortality not increased. In the perineal case we have less shock, and less danger of ascending infection.

As a result of trauma to the bladder incident to opening and removing the gland, the expulsive power of the bladder is diminished and thus gravity drainage is very important. It is immediately established by means of a large catheter which is allowed to remain in position. Self-retaining catheters and these fixed in position by means of adhesive are unsatisfactory, and he has devised a method in which a strong piece of linen thread is sewed through the eye of the catheter, which extends into the bladder one inch, and then brought out through the abdominal wall lateral to the wound and tied over a rubber tube. When the catheter is removed the linen is drawn up one inch, iodined, cut off, and the catheter withdrawn. He uses aromatic sulphuric acid to keep the earth phosphates in solution and prevent precipitation on the catheter.

The drainage tube in the wound should be of firm material and of large size. It is fastened to the bladder wall by a purse string suture, drawn tightly, which maintains a water-tight union for about a week. After the operation the bladder is irrigated freely with hot boric to test the drainage system and to remove blood. Drip irrigation is started, entering the large tube and draining out of the catheter. Ice cold boric is used if the patient is not too feeble. The bladder is flushed every three hours.

If clots form to obstruct the drainage they may be aspirated by means of a large syringe or flushed out with the irrigation.

There being no adhesive tape on the catheter, local cleanliness is made much easier, and should be accomplished by means of frequent use of soap and water and bichloride. In the later stages when hemorrhage has ceased and mucous has begun to clog the tube, soda solution is of assistance as an irrigation. The importance of shortening the period in bed is emphasized. The patient should be up on a back rest early and out of bed in two to four days.

The upper drainage tube is removed in two to four days, but the catheter remains until the bladder function is restored, from one to three weeks. After the upper tube has been removed a clamp may be put on the catheter and removed every half hour, in order to help restore the muscle tone of the bladder.

After leaving the hospital routine care, proper nursing, and advice as to habits should be given.

Laxatives, urinary antiseptics and the care of any remaining cystitis, should be considered very important.

HAROLD E. HULLSIEK.

GYNECOLOGY AND OBSTETRICS

SUPERVISORS:

ARCHIBALD L. McDONALD,
FIDELITY BLDG., DULUTH.

ALBERT G. SCHULZE,
LOWRY BLDG., ST. PAUL.

INCISIONS OF THE INTRAVAGINAL PORTION OF THE CERVIX IN THE COURSE OF LABOR AT TERM:

M. V. Cathala, (*Gyn. et Ob. Revue Mensuelle*, Vol. 1, No. 2). Although this procedure is unpopular in France, the author attributes bad results to improper selection of cases and unstandardized technique. When definite indications have been met such incisions permit prompt and safe delivery at term. Concerning obliteration and dilatation of the cervix, Cathala lays more stress on the condition of the ring formed by the attachment of the vagina about the cervix. Unless this has been dilated to a diameter of about 9 cm, passage of the fetal head will result in extension of the incisions as lacerations into the broad ligaments no matter what be the condition of the cervix. The degree of this dilatation may be measured or estimated by the arc of a circle formed by the protruding presenting part and cervix into the vagina. To give a diameter of 9 cm the arc should be at least 14 cm measured by the fingers in the lateral culdesacs. If the greatest diameter of the fetal skull has passed or can pass this ring, incisions are permissible, otherwise vaginal cesarean section is indicated. The author reports 14 cases, 12 of whom were primiparae. Indications were fatigue of the mother or fetal distress. Delay was due to scar tissue in 1, and slight pelvic contraction in 12, with slow and imperfect dilatation of the cervix.

Other methods: Bags are difficult to insert between fetal head and distended cervix, and are likely to disturb engagement and position. Manual Dilatation is often incomplete and may result in extensive tears. Instrumental dilatation is even more dangerous. Method: The author uses an anterior incision in the median line and if necessary also posteriorly, large vessels are avoided, there is less hemorrhage, apposition is better, and there is less eversion or deformity. If it becomes evident that the head can not pass the vaginal ring, one can still do a typical vaginal section. He does not incise the perineum. With good retraction the cervix is visible and tenacula are not used. The incisions are not sutured since apposition is good, the cervix oedematous, and hemorrhage from the wound is not severe unless the tear extends into the vagina or up into the lower uterine segment. Postpartum atony may require packing. Danger of infection is not increased by the

incisions but depends on the condition of the mother. Natural healing with no deformity occurs as a rule.
ARCHIBALD L. McDONALD.

PEDIATRICS

SUPERVISORS:

FREDERICK C. RODDA,
SYNDICATE BLDG., MINNEAPOLIS.

ROY N. ANDREWS,
MANKATO CLINIC, MANKATO.

A STUDY OF PNEUMONIA IN INFANCY AND CHILDHOOD DURING RECENT EPIDEMICS:
Henry Helman (Am. Jour. Dis. of Child., August, 1920). Pathology—Out of 336 cases we found the left lower lobe most frequently involved in lobar and bronchopneumonia. In our cases that came to necropsy, there were typical areas of consolidation in all stages, and hemorrhagic foci were almost constant.

Wollstein and Goldbloom, from necropsy findings in 18 cases in infants, report that the characteristic features were purulent infiltrations of the alveolar walls and septa, hemorrhages and suppurative bronchiolitis.

Roentgen-Ray Findings. Of 28 roentgenograms of the chest taken in cases of lobar pneumonia, 25 showed definite shadows. Of 73 cases of bronchopneumonia, 68 showed more or less distinct shadows, which were interpreted as infiltrations. In 8 cases in which no physical signs were elicited, but presented the clinical picture of pneumonia, the roentgen-ray revealed the presence of lesions in the lung. We have found the roentgen ray of invaluable assistance in the diagnosis of both types of pneumonia.

Blood Examinations. A count below 10,000 and a polymorphonuclear count below 50 per cent is significant of a very poor resistance. The average blood picture was 25,000 leukocytes with 80 per cent polymorphonuclears.

Complications. The most frequent complication encountered was acute otitis media. Treatment was conservative. Unless there is a distinct bulging we do not incise.

Empyema developed in seventeen cases. We strongly advise against early operation before the acute stage had subsided. The results obtained by watchful waiting in these cases are immeasurably better than immediate operative interference after the aspiration of pus from the pleural cavity.

Treatment. Of prime importance is the hygienic care and efficient nursing. A bright sunny room, with an abundance of fresh air, quiet surroundings and well trained nurses under close supervision are important essentials.

We do not favor the cold air treatment in any type of case. The gastro-intestinal tract should receive the closest attention. An abundance of water, gruels, and fruit juices are indicated. We do not

recommend the general use of digitalis, for we have obtained no appreciable beneficial results from the same. May we not look forward to further differentiation of types of organisms in the pneumonias of infants and children with the hope of securing specific therapy?

ROY N. ANDREWS.

ROENTGENOLOGY

SUPERVISORS:

C. U. DESJARDINS,
MAYO CLINIC, ROCHESTER.

R. G. ALLISON,
SYNDICATE BLDG., MINNEAPOLIS.

A PRACTICAL METHOD OF ROENTGEN RAY DOSAGE WITHOUT THE AID OF A RADIOMETER:
William D. Witherbee and John Remer—(Arch. Derm. and Syph., May, 1920). The method has been in fairly general use for two and one-half years and its chief advantages are its easy application and practicability. It can be used with any standard interrupterless machine and Coolidge tube.

The authors define the standard of roentgen ray dosage. The amount of radiation reaching the skin is determined by four factors: voltage or K. V.; milliamperage or current (MA); the time (T in minutes), and the distance from target to skin (D in inches). Voltage (K.V.) is often expressed in inches between the spark gap terminals. Analysis of the four factors involves maintaining three of them constant throughout the exposure. It was found that an area of the chest given 3 Sp. G., 3 MA at a distance of 8 inches for four minutes caused the hair to fall out during the third week, but that it all returned by the fourth month. This formula (3 Sp G—3 MA—4 minutes, with 8 inches distance) is called one skin unit, and is the dose required for treating ringworm of the scalp. It would correspond to one on the Holzknecht radiometer, which, in Holzknecht units, would be 4 H.

By using pastils and a Holzknecht radiometer it has been found that, if time, voltage or milliamperage are doubled separately, the other three factors remaining constant, the dose will be doubled if no filter is used; also that the reading at the half distance will be four times that on the skin at full distance, therefore inversely to the square of the distance.

3 Sp G	3 MA	8 D	2 minutes equals $\frac{1}{2}$ skin unit.
6 Sp G	3 MA	8 D	2 minutes equals 1 skin unit.
3 Sp G	6 MA	8 D	2 minutes equals 1 skin unit.
3 Sp G	3 MA	16 D	4 minutes equals $\frac{1}{2}$ skin unit.
3 Sp G	3 MA	8 D	4 minutes equals 1 skin unit.

The dose of one skin unit adopted by the authors as their standard would be expressed as follows:

3 Sp G x 3 MA x 4 minutes	or	$\frac{3 \times 3 \times 4}{8 \times 8}$	or	$\frac{9}{16}$
---------------------------	----	--	----	----------------

Many examples are given to illustrate the use of the method in finding out any factor the other three being known, such as the distance at which it would

require a certain voltage, milliamperage and exposure to give a standard dose. The method may also be used in roentgenography to determine the number of plates that may safely be taken of a given area. If 3 Sp G—3 MA—2 minutes is used, what is the dose?

$$\begin{array}{r} 8 \text{ inch D} \times 8 \text{ inch D} \\ 3 \times 3 \times 2 \text{ equals } 9 \\ \hline 8 \times 8 \quad 32; \quad 8 \times 8 \quad 64 \quad 16 \\ \hline \end{array}$$

standard or skin unit. $\frac{32}{16} \times 9 \text{ equals } \frac{1}{2} \text{ skin unit.}$

If one wants to use 3 Sp G—3 MA and 8 inches distance to give $\frac{1}{2}$ a skin unit, how much time will be required?

$$\begin{array}{r} 3 \times 3 \times T \text{ equals } 9 \\ \hline 8 \times 8 \quad 64 \\ \hline \end{array}$$

The standard for 1 skin unit is:
9; or for $\frac{1}{2}$ — $\frac{9}{2} \times 9 \times 9 \text{ equals } 2 \text{ minutes' time.}$
 $\frac{16}{32} \quad \frac{16}{32} \quad \frac{16}{64}$

The distance required to produce one skin unit is found by dividing the product of the three known factors by the standard formula for one skin unit $\frac{9}{16}$

With all four factors known, the product of their formula divided by the product of the standard formula for one skin unit $\frac{9}{16}$ will give the dosage

in skin units. If one of the four factors is unknown, and the other three decided on, the product of the standard formula for one skin unit $\frac{9}{16}$ divided by

the product of the three known factors gives the unknown factor for one skin unit.

The dose of unfiltered roentgen ray can thus be accurately and easily determined, but owing to the proportionately large filtration of the ray generated below a 3 m gap or 3 Sp G by the glass in the Coolidge tube the above rule of unfiltered dosage does not apply.

A. U. DESJARDINS.

BOOK REVIEWS

A TEXTBOOK OF DERMATOLOGY. By J. Darier. Authorized translation from the second French edition, edited with notes, by S. Pollitzer, M. D. Illustrated. Lea and Febiger, Philadelphia, 1920. Price, \$8.50.

This book presents to the English student the work and viewpoint of the French School of Dermatology. Written by a master of his subject, one whose greatest characteristic as a writer is his clear description of lesions as well as of pathological anatomy, it cannot fail to hold the interest of the student of dermatology.

The first edition of the translation was exhausted several years ago, and the delay in the appearance of the second has been due to the great war.

The work is carefully translated and edited, well printed on excellent paper, illustrated with numerous engravings and although not as large a volume as

some works on dermatology deserves a place among the best of its kind.

E. C. GAGER.

DISEASES OF THE CHEST AND PRINCIPLES OF PHYSICAL DIAGNOSIS. George William Norris, A. B. M. D. and Henry R. M. Landis, A. B. M. D. Second edition. W. B. Saunders Co., \$8.00.

The second edition of this excellent work contains several new chapters, including one on electrocardiography. It is profusely illustrated not only with photographs of isolated organs but also with reproductions of sections through the chests of frozen cadavers.

It is somewhat surprising to note in such a fine treatise on chest conditions, that the X-Ray, as a diagnostic aid in detecting early tuberculosis, is discarded as being of no avail.

It is a book, however, deserving a place in the library of every careful physician.

EVERETT K. GEER.

PRINCIPLES AND PRACTICE OF INFANT FEEDING. By Julius H. Hess, M. D. Second revised edition, 1919. F. A. Davis Company, Publishers, Philadelphia. Price \$2.50.

In this second edition the author follows the same general outlines as in the first edition. He presents the subject in a small volume of about 350 pages in a concise form, taking up both the theoretical and practical sides of infant feeding.

Throughout the work he has made revisions and additions which have enhanced its value for the teacher, practitioner, student and nurse. In the chapter on metabolism he has enlarged upon the discussion of the lipoids and introduced a new paragraph on vitamins; setting forth the present status of our knowledge of these substances and their relation to growth and normal development. The most material change made has been in the chapter on artificial feeding. Here he establishes, as an absolute basis for the preparation of the diets, the requirements of the infants in grams per pound body weight, of proteins, fats, carbohydrates, salts and water for growth and development, rather than the percentage composition of the mixture or its caloric value, though both these methods are given as a check on the formula.

The work retains all the important and essential details of the first edition, which made it so acceptable to all interested in this vital subject, and all who have occasion to consult the second edition will find it even more helpful with the revisions and additions.

J. D. GEISSINGER.

